JULY, 1952

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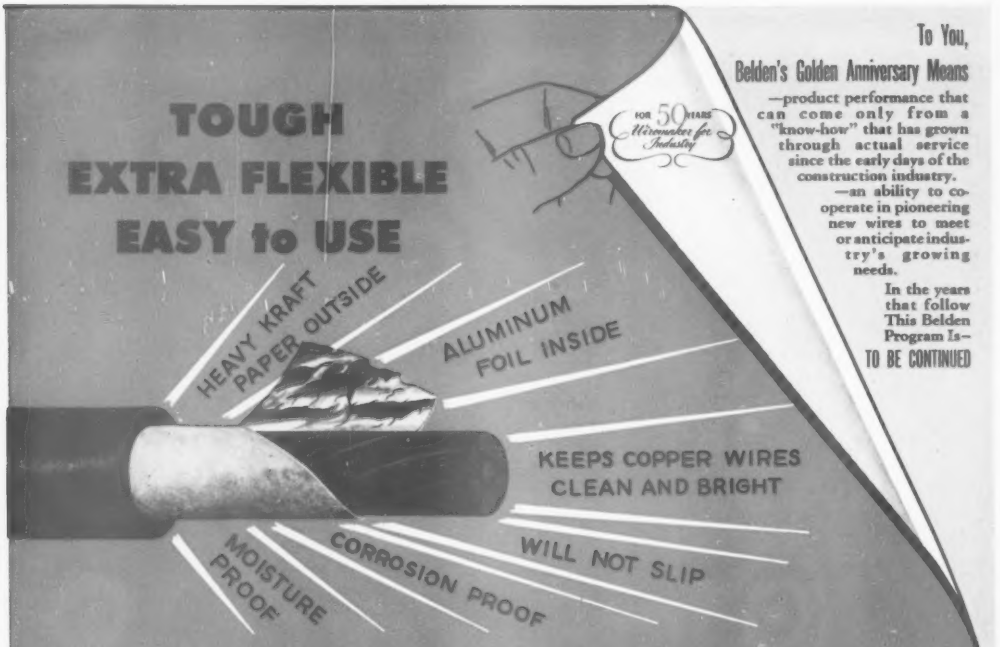

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THE WELDING ENGINEER

A McGRAW-HILL PUBLICATION

VOLUME 37 NUMBER 7

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THE WELDING ENGINEER • JULY • Vol. 37—No. 7

(with which is combined The Acetylene Journal)
Member ABC and ABP

Published monthly, with an additional directory number in June, by McGraw-Hill Publishing Company, James H. McGraw (1860-1948), Founder. Publication Office: 671 North Franklin Street, Chicago 10.

Executive and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice-President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.

Editorial Office: 520 N. Michigan Ave., Chicago 11, Ill.

Subscriptions: Address correspondence to J. E. Blackburn, Jr., director of circulation, The Welding Engineer, 671 North Franklin St., Chicago 10, Ill., or 330 W. 42nd St., New York 36, N. Y. Allow ten days for change of address. Subscriptions are solicited only from executives, engineers, technicians and supervisory personnel in plants engaged in production or maintenance welding processes. Position and company connection must be indicated on subscription orders.

Single copies 35c. Subscription rates—United States and possessions $3 a year; $4 for two years; $5 for three years. Canada $5 a year; $8 for two years, and $10 for three years. All other countries $15 a year; $25 for two years; $30 for three years. Entered as second class matter Aug. 23, 1948, at the Post Office at Chicago, Ill., under Act of Mar. 3, 1879. Printed in U.S.A.

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THE WELDING ENGINEER is indexed regularly by Engineering Index, Inc.

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JACKSON
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No. 2/0

GROUNDWORK

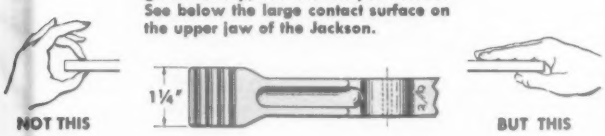
for Profitable Welding

Arc Welders must put on the heat. But only at one point: at the end of the electrode. And any heat elsewhere along the welding circuit means current wasted.

Don't rely on makeshift ground connections, inefficient and unwieldy C-clamps and plates, and on hastily made cable splices, ineffective and unstable.

Wherever connections must be made in the circuit, choose Jackson cable fittings which provide ample metal-to-metal contact to ease the flow, and stop the loss of current.

For greater metal-to-metal contact in a ground clamp, which would you choose? See below the large contact surface on the upper jaw of the Jackson.



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When choosing between ground clamps, take a close look at the Jackson, and note the large, flat contact surface of the copper alloy upper tong. It provides the greatest and surest conductivity between the clamp and the work.

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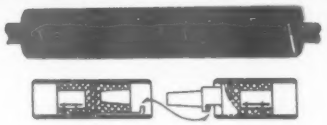

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The safest way of making cable extensions. By connecting the female unit to the cable lead, the live cable end is always well insulated when not in use. Units lock tight by a twist of the hand. To avoid delays in your shop, keep your stock of replacement holders on hand with a length of cable and a male unit of the cable connector fastened to them. Then, if a holder needs replacing, get a spare and connect it in a minute.

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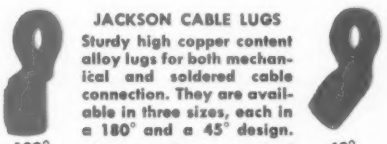
Cable ends make adequate metal-to-metal contact with the copper alloy splicer, clamped, soldered, or brazed. For permanent, well insulated extensions; time saving, economical.



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180° ***Please specify type required*** 45°

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				jaw opening	price	price	price	price
No. 1	4 thru 1/0	mechanical or soldered	300 amp	1⅛"	2.75	2.95	1.60	.80
No. 2/0	1/0 and 2/0	mechanical or soldered	500 amp	1¾"	3.50	3.75	1.85	.90
No. 4/0	3/0 and 4/0	soldered only	500 amp	1⅝"	3.25	3.50	1.50	.80

NEWS FROM WASHINGTON

Nickel Shortage Acute, Warn NPA Officials

NATIONAL Production Authority feels that the public does not yet realize how acute the shortage of nickel really is. The "public" includes users of welding, who are advised to go back to the old methods of welding cast iron in order to conserve as much nickel as possible.

The advent of the nickel-base electrode worked a virtual revolution in the welding of cast iron. Now NPA wants the trend to be reversed. Too many companies, say NPA officials, stress the need for nickel-base rods when they are not absolutely necessary. If a preheat is used, a good job can often be done with cast-iron or steel electrodes. They also suggest employment of bronze electrodes to weld cast iron, something seldom done anymore.

Export agencies have buyers clammering for 95% nickel rods, and the pressure is simply terrific to make more nickel welding wire available.

Officials say the fourth quarter is going to be farther behind on the high-nickel alloys and not enough metal is going to be allocated to take care of present needs, let alone catch up with the demand.

Ask Identification of R-W Electrode Orders

SOME formal method to identify defense and non-defense orders for resistance-welding electrodes should be devised, according to a recommendation by the Resistance Welder Electrode Manufacturers' Industry Advisory Committee. So far, though, nothing has been done about the recommendation.

Most manufacturers are doing their own identifying at present. General feeling is, however, that some manner of distinguishing orders should be used so as to determine which orders should be treated preferentially.

Wreckers' Scrap Drive Produced Results

AUTO WRECKERS scrapped 3,711,820 cars and 649,621 trucks during 1951, a 150% increase over 1950. The results are reflected in the greatly improved scrap situation.

Scrap metal on hand March 30, 1952, was 4,528,635 gross tons, an increase of over 300,000 gross tons over the February supply. By April, 165 steel mills had reported a near 60-day supply. During last January, there was only a three-day supply, and eight open-hearth furnaces had to shut down because of the shortage.

NPA Director of Salvage Edward W. Greb and Marvin Plant, chief of the Scrap Section in the Iron and Steel Division, issued a joint statement. "The auto wreckers' industry," they said, "has done a magnificent job and it deservedly wins the government's gratitude for making such a major contribution to the defense program."

After cutting up cars and trucks with oxyacetlene torches, the wreckers extracted and shipped to the scrap dealers 76,000 short tons of copper and brass radiators, 58,000 short tons of battery lead, 39,000 short tons of die-cast metal and 4,000,000 long tons of iron and steel.

Unanimously, the dealers' committee meeting with NPA recommended to the government the revoking of Order M-92 as the order had achieved its goal of expediting the flow of critically needed scrap to the mills.

NPA officials urged the wreckers to continue to build up inventories of scrap and agreed to consider the recommendation of revoking M-92.

Military May Use Welded Steel Tubing

PRESENT shortage of seamless steel tubing may bring about the use of welded steel tubing by the military. The Welded and Seamless Steel Tubing Technical Industry Advisory Committee, meeting recently with the Nation Production Authority, disclosed that the present capacity of the seamless-tube mills is extremely limited. On the other hand, some manufacturers of resistance-welded tubing will operate at less than capacity for the balance of the year.

Expansion Planned for Synthetic Cryolite

PRODUCTION of synthetic cryolite is expected to be increased to 50,000 net tons by 1955. This is an overall increase of 21,600 net tons over present production.

Only world source of cryolite is Greenland. The mines there, however, are not expected to produce more than a decade longer as they are slowly being worked out. Cryolite is absolutely necessary in the electrolytic reduction of aluminum and as a welding and brazing flux so a program of expansion has been set that will relieve the shortage by 1955—before the Greenland mines are no longer profitable to operate.

Chemical compostion of cryolite is sodium aluminum fluoride, but the manufactured or synthetic is made from fluorspar, sulphuric acid, hydrated alumina and sodium carbonate. It is currently used in the manufacture of special glass and porcelain, as a binder in abrasive wheels and as an insecticide.

Supplies of natural cryolite, stocks in the national stockpile and stocks of the present one and only cryolite processor are expected to be wholly used up to cover present shortages and to provide for the conversion to the synthetic product. Aluminum companies are now reclaiming the cryolite that has been absorbed in the carbon linings of electrolytic pots. Plants for cryolite reclaiming will be built by Reynolds Metals Co. and Kaiser Aluminum and Chemical Co. Other plants will be built for the synthetic process.

NEWS FROM WASHINGTON (Continued from page 5)

1951 Packaging Costs Over $3,000,000,000

INDUSTRY standards for electrode welding rod packages that are suitable for all government agencies and the services are becoming more of a possibility every day.

The Munitions Board Standards Agency, under the direction of Russell A. Moody, has invited electrode makers to call on it whenever the industry and the various departments or services cannot agree on suitable packaging. This agency has been highly successful in establishing uniform standards of specifications for products purchased by the various branches of the federal government (THE WELDING ENGINEER, June, 1952, page 5).

Industry should deal with the departments or services direct, said Mr. Moody. If no agreement can be reached, however, then the Board's chief of packaging, R. A. Norris, will step in when called upon to help iron out the differences.

The Board is interested in economy in packaging, which means no excessive packaging, and it is vitally interested in making it easy for industry to meet military requirements.

At present there are approximately 20,000 specifications pertaining to the packaging of materials and packaged items. These the Board hopes to reduce to under 1,000 specifications.

The fiscal year cost for 1951 packaging, figured at 6% of procurements, was over $3,000,000,000. There are 30 billion estimated items of supply in the Department of Defense alone so packaging is a big problem.

Rutile Consumption Increases Every Year

RUTILE (titanium dioxide) is still in very short supply, and from all indications will continue to remain so for quite awhile. Imports from Australia were 11,000 tons in 1951, 13,000 tons in 1952 and a possibility of 15,000 tons in 1953. In accordance with the well known law of supply and demand, the price has gone up from $95 per ton to $225 per ton, and in some instances even higher

This fluxing agent is used in the making of coatings for mild-steel electrodes. Experiments have proved 25% "Tanarc" and 75% rutile are satisfactory for certain types of rod, and defense officials have asked the industry to use this formula wherever possible.

NPA Revokes Five Metal Control Orders

COMPLETE revocation of orders controling bismuth (M-48), cadmium (M-19), antimony (M-39), end use of lead (M-38) and distribution of lead (M-76) has been announced by the National Production Authority. Supplies of these metals are now sufficient to meet demands, according to NPA Administrator Henry H. Fowler, allowing controls to be removed.

Zinc control order M-9 has been amended to remove allocation and use controls. The amendment also abolishes restrictions on acceptance, delivery and distribution of zinc scrap and toll agreements. It is estimated that the 1952 supply of slab zinc will be approximately 1,079,000 short tons and consumption about 933,000 short tons.

Of the metals affected by the revocation of control orders, cadmium is an element obtained primarily as a by-product of the zinc industry. We produce about 9,000,000 lb per year.

Bismuth supplies increased 13% from February 1, 1951, to February 1, 1952. Statistics will be kept covering the supply and demand.

Antimony, used in soft metal alloys, is in normal demand, and industry appears to be able to meet requirements. The price has been reduced, which justifies the relaxing of controls. Data will continue to be collected, however, by the Bureau of Mines and the filing of reporting form, 6-1016-M is still mandatory. The Bureau will furnish tabulations of supply to NPA as required.

Lead controls are no longer needed as supplies are adequate for both current consumption and for substantial additions to the national stock pile. The supply will reach 1,285,400 short tons and consumption will be approximately 1,200,000 short tons.

75 Flux Ingredients Are in Short Supply

NPA OFFICIALS say that of the over 300 different materials used for the coatings of electrodes at least 25% are in short supply. Shortage of six of these materials is critical.

A good many of the flux ingredients are imported, and an expanded demand creates a continual struggle to maintain a reasonable balance of supply.

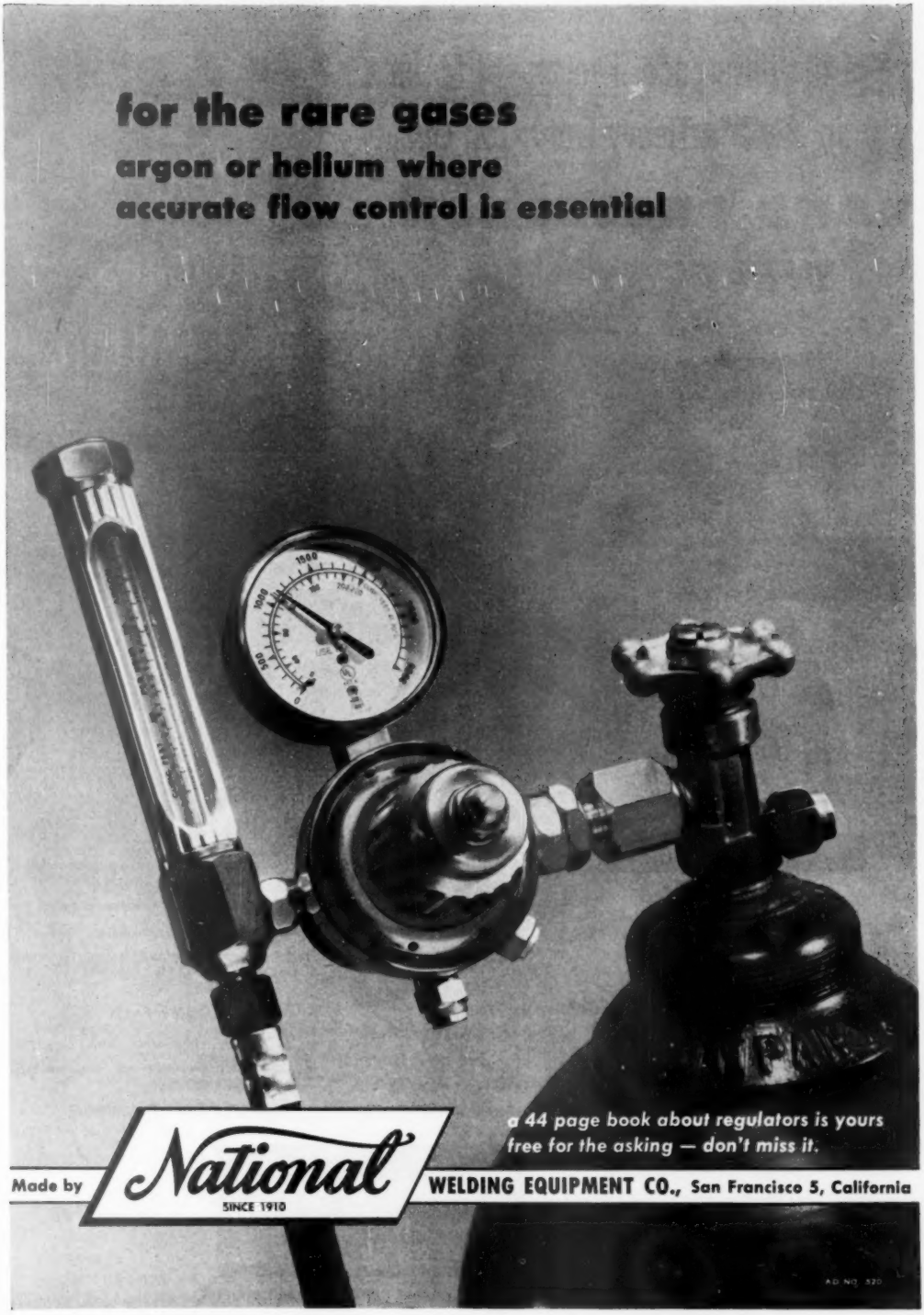
While on the subject of fluxes, the heavy demand expected from the military for low-hydrogen electrodes has not yet materialized because of the lagging programs for military tanks and jet aircraft engines. The blame for the lagging programs seems to be the continued drawing board and blueprint changes in design, even after production has been authorized.

The military is sold on the low-hydrogen electrode, and large-volume use of it expected to be attained once the tanks and engines are in full production.

New List on Scarce Metals Being Prepared

LIKE Ko-Ko, the National Production Authority has a "little list." Unlike the famous list in the Mikado, however, the new NPA list contains only items that certainly will be missed. The list, now in process of preparation, includes such materials as cryolite, rutile, nickel, titanium, columbium, molybdenum, tantalum and cobalt.

The list is called "Basic Materials and Alternates Conservation" and covers everything from limits to the prohibited use of all scarce metals and mineral products.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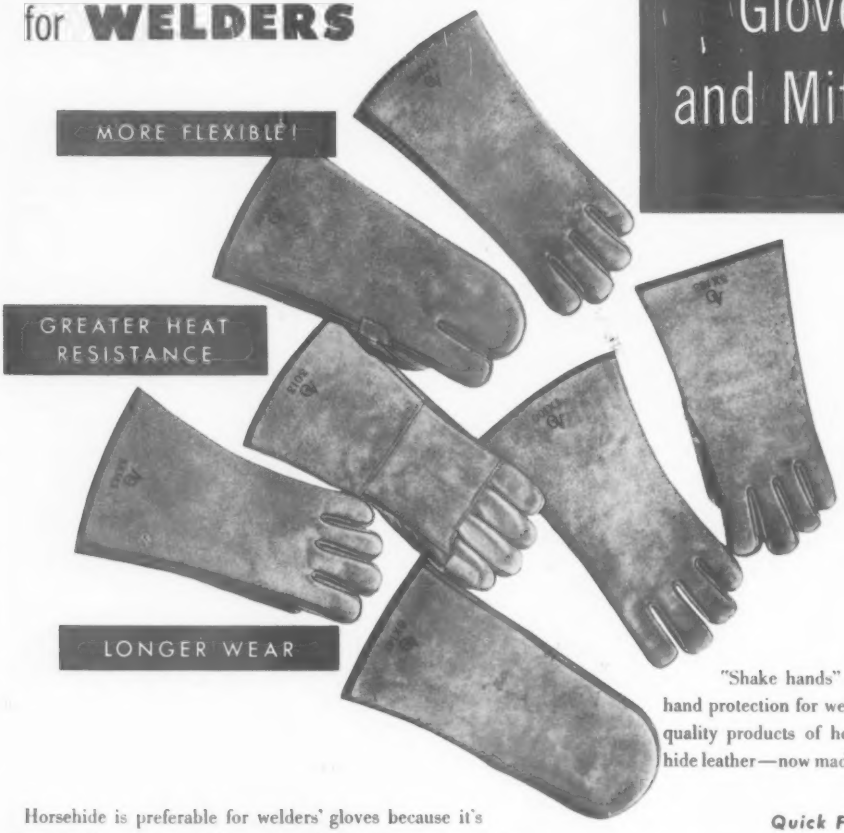

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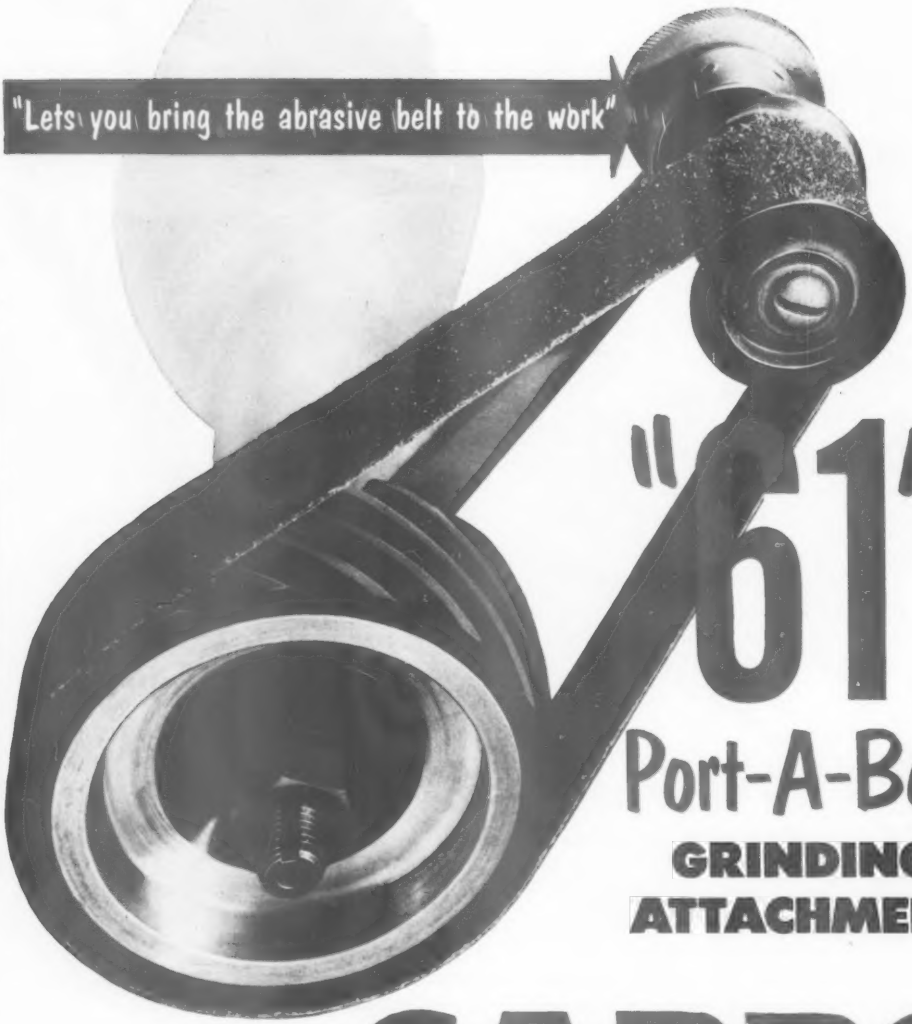
Another terrific



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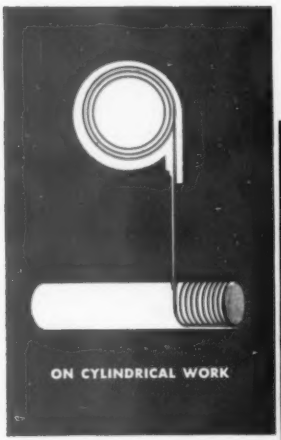

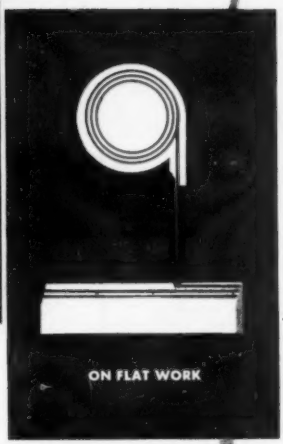

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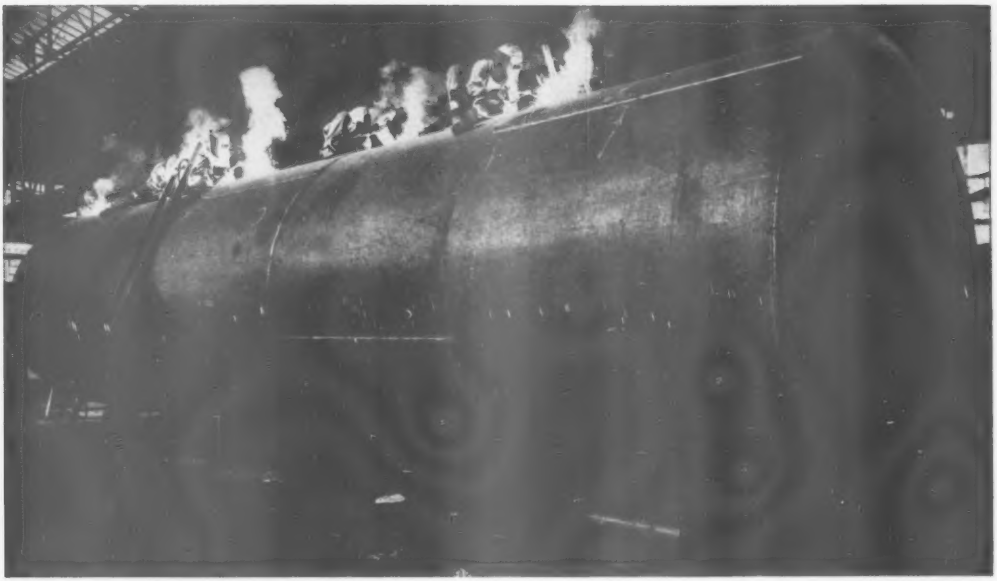
Stoody 104 was specifically developed to supply properties lacking in high carbon weldments—exceptional strength, ductility, resistance to abrasion and deformation. Designed also as a final overlay for certain types of equipment such as tractor track rails, sheaves, mine car wheels, etc.

Stoody 104 bonds readily to all weldable SAE and AISI steels, forms an ideal underlay for hard-facing alloys. Deposits are readily machinable and respond to heat treatment.

Ask for fully descriptive folder from your Stoody dealer . . . listed in the telephone directory "yellow pages" . . . or write to

STOODY COMPANY

11941 E. SLAUSON AVENUE,
WHITTIER, CALIFORNIA



WORTHINGTON TURNING ROLLS IN OPERATION move this big tank at exactly the right speed for the most efficient downhand welding. This equipment often increases output as much as 50% because downhand welding with heavier electrodes does the job with one pass instead of two or three.

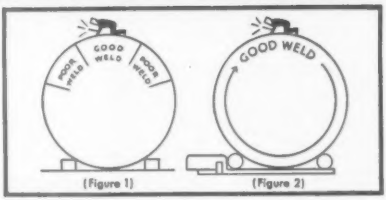
A way to lower your welding costs as much as 50%

If you are welding cylindrical vessels of any size, you can lower costs and increase welding footage as much as 50% with Worthington Turning Rolls.

Your welders can produce more *real footage* by eliminating time wasted in manually turning the vessel or waiting for crane or hoist service.

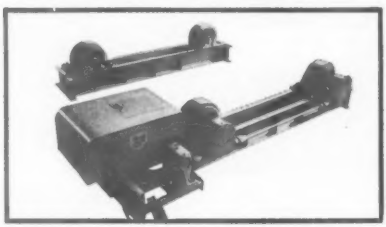
You'll get neater, stronger welds and less rod waste, too. The Worthington Turning Roll power turns the vessel at selected welding speeds for quickest spotting of longitudinal seams and continuous welding of circumferential seams. All welds can be made by the convenient downhand method with the economies that result from larger electrodes used.

Where can you see a Worthington Turning Roll at work near you? Just write Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Plainfield, N. J., for this information or for Bulletin 210C.



WHY WORTHINGTON TURNING ROLLS INSURE BETTER WELDS

Unless the work is turned continuously, good downhand welding is obtainable only in small area (Fig. 1). With a Worthington Turning Roll, downhand welding is assured for the complete circumferential seam (either by manual or automatic welding) (Fig. 2).



WORTHINGTON'S LOW-SLUNG DRIVE MECHANISM permits unobstructed loading from either end of turning rolls. The high-efficiency and smooth operation of Worthington power rolls (lower right) and idler rolls (upper left) result from long and varied experience in building equipment for welding cylindrical vessels.

Y.I.3

WORTHINGTON

Welding Positioners
Turning Rolls

"ANACONDA's the best rod I've ever used! And I've tried 'em all."

—says Magnus Hansen, Shop Foreman and Welder for Brown Brothers Welding Shop, San Francisco

"I've been a welder a long time. Been with Brown Brothers 34 years. I know good rod. ANACONDA-997 (Low Fuming) Bronze Rod flows readily at low temperature. Work needs less preheating. This rod 'tins' easily. And it's easy to machine.

"We use ANACONDA Rods on many jobs. We do every kind of work—both oxyacetylene and electric. We've welded every kind of metal on everything from ships to toy tractors."

Good welders rely on ANACONDA Rods, available from distributors throughout the United States. When you face a tough welding job, contact your nearest supplier. Chances are he's an experienced welder himself, ready to help you. For information on welding techniques write for free booklet B-13. The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass, Ltd., New Toronto, Ont.

52173

braze or weld with confidence— ANACONDA® welding rods

ANACONDA

Challenging

the Industry

with the

Best Buy in AC Welders!

Offering more welding production, per dollar invested, than any competitive welder in its price class!

Proven in continuous 3-shift operation on world's toughest production welding assignments...equivalent to *years* of normal shop use!

FEATURING:

- **Wide Amperage Range for adaptability to more welding jobs!**
- **75-Volt Open Circuit, eliminating need for starters or other gadgets!**
- **Smoother, higher-quality welds!**
- **Safer, quieter operation!**
- **Convenient, sure welding connections!**
- **Peak efficiency always, with ample copper in precision, layer-wound coils!**
- **Rugged Construction throughout assures long life, uninterrupted welding production, minimum maintenance!**

You Can't Buy Better than the A. O. Smith CHALLENGER Production Welder. For literature, write:

A. O. Smith Corporation, Dept. WE-752
Welding Products Division, Milwaukee 1, Wis.
International Division, P. O. Box 2023, Milwaukee 1, Wis., U. S. A.

A.O.Smith
WELDING PRODUCTS

Made* by *Welders*... for *Welders

Welding Info-Aids

201 BACK-UP FLUX—Solar Aircraft Co., Research Products Div. 16-page, pocket-size booklet tells how to cut costs in arc, inert-arc and other fusion welding processes by using Solar fluxes and back-up fluxes. Useful not only for aluminum, these fluxes can be used on many types of stainless and alloy steels.

202 ARC WELDERS—Trindl Products Ltd. Single-sheet bulletins give complete data on eight models of industrial arc welders. Sizes of electrode recommended for each welder, capacity of steel, and price are listed.

203 WELDING CURTAINS—A. Smith & Son, Inc. Pocket-size bulletin describes welding curtains made of a close-woven canvas impregnated with a special flame-proofing compound.

204 PIPE SCALLOPER—Harold Dessau, Inc. 4-page folder describes the versatile cutting abilities of the Stratford "pipe scalloper and template maker." Clear photos show the machine with extension table and template maker. Types of cuts possible are illustrated and described.

205 HELMETS & HOLDERS—The Fibre-Metal Products Co. New, 44-page catalog shows a large diversified line of welding helmets, hand shields, electrode holders, cleaning hammers, weld testers, cables and protective clothing. Also described and illustrated are special goggles, safety masks, coated cover glasses and other items.

206 D-C WELDER BRUSHES—Becker Brothers Carbon Co. 26-page catalog between glossy covers is an excellent and complete guide to carbon brushes for eight major makes of d-c arc welders. Carbon and graphite electrodes, a-c and d-c carbons, welding carbon plates, carbon filler rods and welding pastes are also pictured and described fully.

207 METAL-COATED LENSES—Glendale Optical Co., Inc. Two-color folder describes "Metalcote" filter plates and filter lenses for weldors. Increased visibility makes for better, faster welding and reduces eyestrain and body fatigue, say makers.

208 FLUX RECOVERY—Invincible Vacuum Cleaner Mfg. Co. 6-page, two-color bulletin on Invincible flux recovery equipment for submerged-arc welding shops shows four models and two typical installations. Recovery capacity and specifications are tabulated and explained.

209 WELDING MILD STEEL—The McKay Co. New manual on mild and low alloy steel welding gives not only accepted procedures but includes specifications, operating characteristics, mechanical properties and other essential data on McKay mild steel, low alloy and special purpose electrodes. Other sections cover hard-facing, cast iron welding and maintenance applications.

CARDS NOT GOOD AFTER OCT. 1, 1952

TO OBTAIN: (1) manufacturer's catalog or bulletin described on this page; information on (2) a new product item or (3) an advertised product, use the card sections printed below. Insert number of catalog or new products item or page number of advertised product (add initials of the advertiser if more than one ad appears on the page). THE WELDING ENGINEER will ask manufacturers to send the information requested.

Each card section must be completely filled out. Do not use ditto marks. These cards are not good after Oct. 1, 1952.

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Write page number of ad—plus advertiser's initials if there is more than one advertisement on the page

Number or page number → 97-ASWC
Name John Smith
Company Rex Mfg. Co.
Address 3217 Lewis Ave.
Chicago 16, Ill. Title Engineer
THE WELDING ENGINEER

How to obtain manufacturers' literature or new product information:

Write in number of item.

Number or page number → 231
Name John Smith
Company Rex Mfg. Co.
Address 3217 Lewis Ave.,
Chicago 16, Ill. Title Engineer
THE WELDING ENGINEER

Number or page number →
Name
Company
Address
Title
JULY, 1952 THE WELDING ENGINEER

Number or page number →
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CHICAGO 11, ILL.

210 BRONZE WELDING FLUX—Peterson Welding Labs, Inc. Pocket-size bulletin tells about the bronze-welded repair of a punch press using Peterson No. 6 "high heat" welding flux. Other fluxes listed are No. 1 for brazing steel, clean cast iron and welding copper alloys; No. 3 for brazing cast iron at low heat and No. 5 for welding cast iron and steel.

211 ELECTRICAL MAINTENANCE—Westinghouse Electric Corp. 24-page booklet, B-4766, presents a sound maintenance program for electrical apparatus based on the use of genuine renewal parts, repair service plants and engineering and field service. Westinghouse facilities for these services are pictured.

212 VENTILATING HOSE—American Ventilating Hose Co. 4-page bulletin No. 34 describes "Flexaust" spiral-wire reinforced hose and accessories for welding fume control, air conditioning, dust collection and ventilation.

213 WELDOR'S GOGGLES—Fendall Co. 4-page bulletin on cup-type goggles for chippers and oxyacetylene weldors describes eight types of goggle. Construction features, provisions for ventilation and side vision are provided.

214 BRASS WELDING ROD—The American Brass Co. Revised 24-page two-color catalog gives a complete description of Anaconda welding rods and electrodes as well as correct procedures for brass and bronze welding. Excellent illustrations and completely up-to-date text covers all welding processes as well as melting points, federal specifications and shipping weights.

215 FLAME CUTTING—Air Reduction Co. 16-page reprint (Form ADR 78) is titled "Oxygen Cutting of Defense Equipment Materials." It tells how to develop specifications and procedure control for flame-cutting various steels used in defense work.

216 WELDED PLOW POINT—Adams Alloy Co. Single-sheet bulletin gives step-by-step procedure for hard-facing and applying a "Metalite" plow point bar to plowshares. Line drawings with dimensions accompany each direction.

217 SUBMERGED-ARC PREHEAT—Linde Air Products Co. 12-page reprint discusses control of grain growth and improving of ductility by proper preheat and postheat on submerged-arc weldments. Diagrams show data and suggested heating times for 24 grades of SAE steels.

218 ELECTRODE OVEN—Fred C. Archer, Inc. 4-page, two-color bulletin gives three large photos of the "Blueweld" oven for stabilizing low-hydrogen type electrodes. Operating parts, such as ventilator, shelving, dehydrator and thermostat are listed, and specifications are completely outlined.

219 FLANGED HEADS—Luken Steel Co. Single-sheet bulletin describes Lukens ready-to-ship standard flanged and dished and ASME flanged and dished heads. Two large tables give stock numbers, OD's, etc.

220 WELDING POSITIONERS—The Pandjiris Weldment Co. 4-page, two-color bulletin gives large illustrations and complete listings of specifications on "Weldmore" positioners and turning rolls. Models, weight capacity, speeds, dimensions are tabulated. Heads and tailstocks for massive weldments are also pictured and characteristics listed.

221 ELECTRIC GRINDERS—Ingersoll-Rand Co. 36-page catalog covers complete Ingersoll-Rand line of multicycle electric tools, including grinders, buffers, sanders and polishers. Pictures, diagrams and tables describe all tools and accessories.

222 WELDING PREHEAT—Tempil Corp. 10-page reprint covers present-day methods of preheating to insure crack-free welds in pressure vessels, piping and other weldments. Author is Tempil's A. B. Teamen. Reprinted from *The Welding Journal*, it has 12 illustrations.

223 A-C WELDER—Metal & Thermit Corp. 4-page two-color bulletin describes the silicone insulation on M&T a-c welders as well as such features as an automatic "hot-start," arc-stabilizing capacitors, compact design and wide current range.

224 WELDING IDEAS—Hobart Brothers Co. 16-page booklet of welding photos and money-making ideas for job shops includes welding news from all over the country.

225 RUBBER HOSE—Carlyle Rubber Co. 8-page bulletin on Carlyle industrial hose assemblies tells about varipurpose, hydraulic, paints and solvents and lubrication hoses. Measurements on fittings, assemblies and apparatus are outlined in detail.

226 TRANSFORMER CATALOG—General Electric Co. The 1952 edition of the Instrument Transformer Buyer's Guide contains basic, up-to-date information on all G-E instrument transformers. The 94-page publication, GEA-4626E, gives ratings, ASA accuracy, etc.

227 PORTABLE TOOL CATALOG—Master Pneumatic Tool Co., Inc. Company catalog lists air-powered grinding tools, assembly tools, percussion tools and air tool accessories. Complete data for every tool is given, including capacity and applications.

CARDS NOT GOOD AFTER OCT. 1, 1952

Insert number of catalog or new products item or page number of advertised product (add initials of advertiser if more than one ad appears on the page). Fill out each card section completely—do not use ditto marks.

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THE WELDING ENGINEER, JULY, 1952

48,000 Spot Welds

with a single MALLORY "Nu-Wrinkle Cap"* Electrode

Outstanding Design Features of MALLORY "Nu-Wrinkle Cap" Electrodes

1. Smooth, annular corrugations of cap skirt provide positive electrical and thermal contact with shank.
2. Resilience of corrugations effects secure attachment of cap to shank.
3. Wiping action of corrugations cleans adjoining surfaces of shank, assures low electrical contact resistance.
4. Hollow cap skirt has the largest practicable cooling area, results in a maximum rate of heat transfer.
5. Smoothly rounded skirt corrugations minimize damage to shank, insure maximum shank life.
6. Unique design eliminates possibility of cap being forced askew into shank.

A well-known manufacturer of farm equipment put Mallory "Nu-Wrinkle" replaceable cap electrodes to work on his production line . . . got more than 48,000 welds with a single cap. Here are the facts:

Material . . . . . 1025 Steel—Pickled
Gauge . . 18 and 20 gauge (0.050"-0.037" thick)
Welding Speed, About 147 spots per minute
Machine 75KVA
Weld Time . . . . . 8 cycles

AND DRESSING TIME WAS CUT TWO-THIRDS by the use of the Mallory "Nu-Wrinkle Caps". Thus the manufacturer was able to save both time and money . . . got more welds per dollar.

• • •

Used 75 "Nu-Wrinkle Caps" on a Single Shank . . .

Additional proof of the economy offered by Mallory "Nu-Wrinkle Caps" is shown by the experience of a West Coast manufacturer who used 75 caps on a single shank. This is exceptional but other users average between 20 and 25 caps per shank . . . save real money.

• • •

It will pay you to team up Mallory "Nu-Wrinkle Caps", shanks and electrode holders . . . to count on Mallory for all your resistance welding needs—electrodes . . . holders . . . dies . . . castings . . . forgings . . . rod and bar stock . . . Elkonite®. Get details today from your distributor . . . or call or write direct to Mallory.

*Trade Mark, Patent Pending

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

P. R. MALLORY & CO. Inc.
MALLORY

SERVING INDUSTRY WITH THESE PRODUCTS:
Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Dry Batteries
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

P. R. MALLORY & CO., INC., INDIANAPOLIS 6, INDIANA

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio.

NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

© LE Co. 1952

HOW TO ESTIMATE SAVINGS WITH STEEL

THE table (Fig. 3) provides a rule-of-thumb comparison on which to estimate savings with welded steel. The figures shown are based on shop costs of $2.00 per hour and 200% overhead. Welded steel designs that do not already average 50% savings can be analyzed similarly to detect excessive fabricating expense.

Fig. 2—"Equivalent Sections in Steel" using good shaping practices are:

TYPE OF LOAD	DESIGN NEED	AMOUNT OF STEEL AREA NEEDED TO REPLACE IRON SECTION
Tension	Rigidity	40%
	Strength	25%
Compression Short Column	Rigidity	40%
	Strength	90%
Compression Long Column	Rigidity	35%
	Strength	35%
Bending	Rigidity	35%
	Strength	20%
Torsion	Rigidity	35%
	Strength	25%

Fig. 3

CASTING		WELDMENT		50% EXCESS MATERIAL DESIGN*	
AVERAGE DESIGN		EQUIVALENT MATERIAL DESIGN			
		50% Cost Reduction	25% Cost Reduction	50% Cost Reduction	25% Cost Reduction
Weight (lbs.)	Cost ($)	Allowed Labor Time (hours)		Allowed Labor Time (hours)	
10	1.60	.11	.17	.09	.16
20	3.20	.22	.35	.18	.32
40	6.40	.43	.70	.36	.63
60	9.60	.65	1.05	.55	.98
80	12.80	.70	1.40	.73	1.27
100	16.00	1.17	1.75	.92	1.59
200	32.00	2.27	3.50	1.83	3.17
300	48.00	3.25	5.25	2.75	4.75
500	80.00	5.42	8.75	4.60	7.90
700	112.00	7.60	12.25	6.40	11.10
1000	160.00	10.85	17.50	9.15	15.80
1500	240.00	16.25	25.40	13.75	23.80
2000	320.00	21.70	35.00	18.35	31.70
2500	400.00	27.10	43.70	22.90	39.50
3000	480.00	32.50	52.50	27.50	47.50

* Products with design sections having 50% more steel than equivalent needed to carry loads.

HOW TO DESIGN IN WELDED STEEL—Complete training course for designers and production engineers now available for presentation in your plant. Send for complete details.

PROPER DESIGN IN STEEL IMPROVES PRODUCT CUTS COST 50%

SINCE steel is credited with being 2½ times more rigid and 4 times stronger than run-of-foundry gray iron, material costs can be cut as much as 95% on many products when converting to welded steel.

Replacing cast iron with steel on a pound-for-pound basis, without changing product shape, cuts material costs 63%. Then, by using the right amount of steel and still without changing product shape, 60% to 75% of the metal can be eliminated and material costs reduced to 15%. Ultimately utilizing a more efficient product shape, possible only with steel, reduces material cost to as low as 5%.

Most production savings are achieved on product conversions where simply the correct amount of steel or "equivalent section in steel" is incorporated into the design (Fig. 2). The chart (Fig. 3) shows how much fabricating is possible on such conversions to maintain overall production savings averaging 50%.

HOW TO SAVE 50%

Machine Design Sheets available on request. Designers and Engineers write on your letterhead to Dept. 77.

THE LINCOLN ELECTRIC COMPANY

CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

ESTABLISHED 1916

THE WELDING ENGINEER

JULY, 1952

New Birth of Freedom

JULY is the anniversary of liberty in the United States. Because our forefathers 176 years ago took the supreme gamble of waging war against a nation infinitely stronger than their own, we have been living under conditions of freedom. We are free to work at the job of our choice, where we please and when we please. Freedom, as we know it, also embraces the right to own property—either as an individual or as a corporation—and forbids us to be deprived of that right without due process of law.

It all adds up to a lot—everything, in fact, that we mean when we speak of "the American way of life."

In recent years we have seen many examples of nations in which people have surrendered their freedom in exchange for an illusory "security." Even in the United States, many people have indicated their willingness to make such an abject surrender.

We have seen the leaders of other nations usurp power. We have seen nation after nation come under the iron fist of a dictatorship. In our own country, also, the trend has been toward the usurpation of power. It is growing easier and easier to give up freedom. But bear in mind that the exchange of freedom for larger social security payments and other types of government handouts is a one-way street—what chemists call a non-reversible reaction. If freedom has been sacrificed, it is only by heroic efforts that liberty can be regained.

WE HAVE but to look around us to see how freedom is lost. Within the last few weeks, this nation was also in the gravest danger of losing a vital freedom. It appeared that the freedom to own property and not to be deprived of it without due process of law would be taken away by a dictatorily issued order. Now the Supreme Court has intervened and ended the danger for the time being. We thank God that the Court has defined the Constitutional power of the President!

The Supreme Court's opinion in the steel seizure case marks the first time in the long history of this illustrious body that it has defined the Constitutional power of the President. The opinion will become an outstanding event in Constitutional interpretation, a history-making decision to set a precedent for as long as our system of law shall endure.

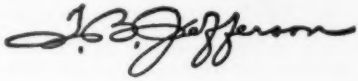
Because of the Supreme Court's action, we may feel with greater confidence that this country will not fall victim to the whims and desires of a single executive, who might easily lead us down the road that would end in the destruction of both our republic and our democracy.

THIS July we have a new birth of freedom to celebrate. But it should be only a beginning. The Declaration of Independence did not liberate us until the last battle of the Revolutionary War had been won. Nor will the Court's decision alone regain the liberties we have already lost. Our own efforts as a united people are needed.

Our next step in regaining control over our own government should be the elimination of greedy public feeding at the taxpayer's expense. Over 35% of the average man's income is taken away from him in taxes. A large portion of this comes out of the pay envelope before he has a chance to see it. Here, at least, he knows how much he is paying, but other taxes are hidden and indirect. In some instances the taxes collected on a product exceed the actual monetary value of the product. This is true in the case of cigarettes, gasoline and coal. On coal, for example, the open and hidden taxes make up over 62% of the cost to the consumer.

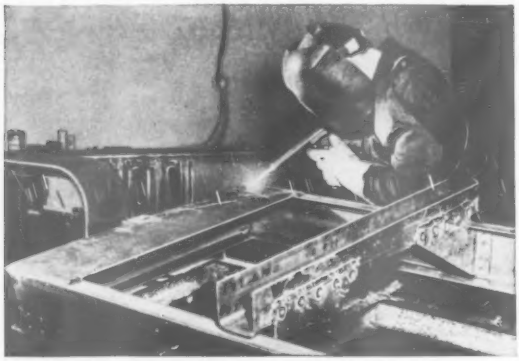
If you buy an automobile, you pay over 200 different taxes on it; a man's suit carries 116 hidden taxes, and more than 475 taxes are paid on the construction and materials that go into a home. No wonder everything costs more than it used to. Why even a welding machine carries at least 115 taxes!

Those people who are willing to give up freedom for what they call "security" should remember that government can give nothing; government can only take away. That is just what it has been doing for many years—taking away money in the form of excessive taxes, taking away the rights of Americans. The time has come to put a stop to it.



Aircomatic welding frame of Marotta Trailer. Each trailer required about 260 lineal inches of weld. Welding wire fed into the joints at 225 inches per minute permitted a new trailer to come off the line every half hour . . . eight times faster than possible with older methods.

Trailers manufactured by the Marotta Engineering Co., Boonton, N. J., for use on U. S. Air Force bases. They are used singly or in trains to move supplies rapidly for plane loadings.



THERE'S A LONG, LONG TRAILER WINDING...

. . . a result of High-Speed AIRCOMATIC® Welding

Trailer trains to move supplies and plane loads rapidly are part of the efficiency found on U. S. Air Forces bases the world over.

Building the required trailers was the job of the Marotta Engineering Co. of Boonton, N. J. For lightweight strength, aluminum was used . . . for rugged dependability and lasting service, arc welded design was chosen.

To match the high quality of the 61S-T6 aluminum . . . and to meet the high production schedules . . . trailers were fabricated with Air Reduction's inert-gas-shielded metal-arc welding process — Aircomatic.

Aluminum — and other hard-to-weld metals, stainless, bronze, monel, and other nickel alloys — are easy-welding when Aircomatic is on the job.

This economical, fast-welding technique makes possible fewer passes on heavier metal . . . faster, heavy deposits for overlay work or build-up. Electrode changes and slag removal are eliminated, permitting almost 100% arc time at high operating speeds.

Facts and figures you need to know about Aircomatic equipment are available in your copy of Catalog 17: "Aircomatic Process" . . . call your nearest Airco office, or write Air Reduction Sales Company, Advertising Department, 60 East 42nd Street, New York 17, N. Y.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND AN AIR REDUCTION PRODUCT

AIRCO®

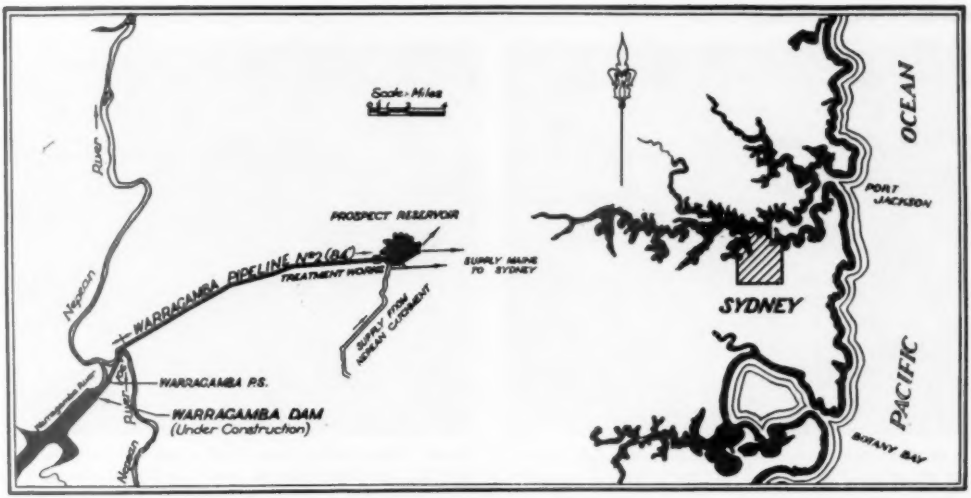
DEALERS AND OFFICES IN PRINCIPAL CITIES

AIR REDUCTION

AIR REDUCTION SALES COMPANY • AIR REDUCTION MAGNOLIA COMPANY • AIR REDUCTION PACIFIC COMPANY

REPRESENTED INTERNATIONALLY BY AIRCO COMPANY INTERNATIONAL

DIVISIONS OF AIR REDUCTION COMPANY, INCORPORATED



1—AUSTRALIA is a land of little rain. That's why they are building a huge water storage project and . . .

Warragamba Pipeline

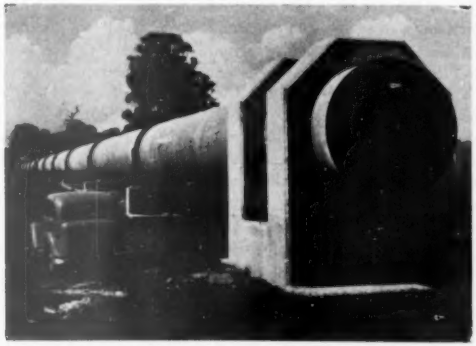
Over 20,000 tons of steel are needed for construction of 88-in. and 111-in. piping that will bring more water to Sydney

BY W. I. MISKOE
Managing Director, Lincoln Electric Co., Australia

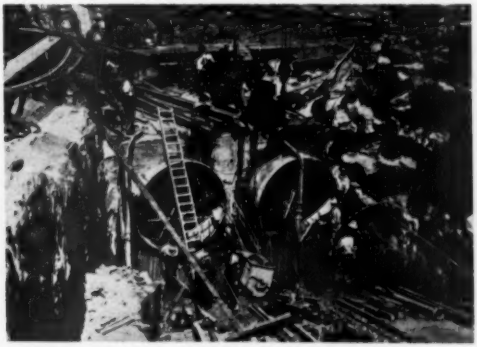
AN ENORMOUS water supply project is being built under direction of the Metropolitan Water, Sewerage and Drainage Board of New South Wales, Sydney, Australia. It involves the erection of a dam with storage capacity of 460 billion gallons and the construction of a pipeline with a maximum gravity discharge rate of 180,000,000 gallons daily. The pipeline, the largest ever built in the down-under continent, will hold approximately 20,000,000 gallons of water when it is completed. More than 20,000 tons of steel and 40,000 tons of cement will be used in its construction.

The project has been accorded widespread interest throughout Australia because of the national importance attached to it. In the drought period of 1934-'42, dwindling water reserves placed the metropolis of Sydney in a most serious position. The new undertaking will more than quadruple the existing storage capacity and place Sydney's supply in an impregnable position for an indefinite period.

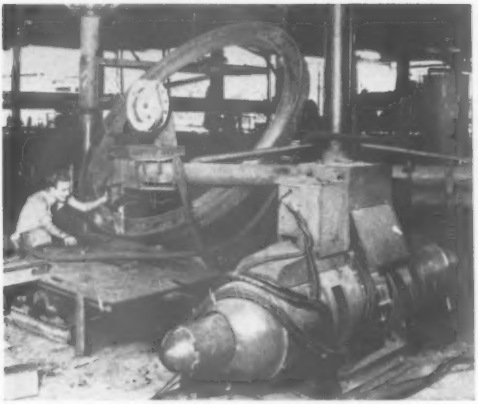
The map (Fig. 1) shows the location of the line between Warragamba dam (on the Warragamba river) and



2—AUTO could drive through this 87¾-in. diameter piping between Warragamba dam and Prospect reservoir



3—EVEN LARGER pipe of 110⅞-in. diameter is laid under Nepean river. Both lines are laid at once



4—STIFFENING rings are welded to the pipe every 45 ft to take the loading at the points of support

5—HYDROSTATIC testing of 15-ft pipe section in foreground; pickling, washing and coating at the rear

Prospect reservoir, a distance of over 17 miles. The project is designed to consist ultimately of two parallel lines of pipe having an OD of 110⅞ in. (nominal bore 106 in. after cement lining) that will join with three lines of pipe of OD 87¾ in. (nominal bore 84 in.). At present only one line is being constructed, partly of the 111-in. and partly of the 88-in. pipes.

The automobile in Fig. 2 gives an idea of the colossal size of even the 88-in. pipe.

111-in. Pipe in Tunnels

The 111-in. pipes are situated at the Warragamba end and are, for the most part, in tunnels. At the crossing of the Nepean river (about two miles from Warragamba dam), both lines are being laid at once (Fig. 3) to avoid future disturbance to the river bed. Near the Nepean crossing, the two 111-in. pipes will join with the three lines of 88-in. piping that will carry the water the remaining 15 miles to the Prospect reservoir.

The pipe sections are being built to the design of the Metropolitan Water Sewerage and Drainage Board by three companies: Hume Steel Ltd., Mephan Ferguson (N.S.W.) Pty. Ltd., and Mort's Engineering Co. A. Pittman Pty. Ltd., is the subcontractor for the transportation of the 17¾-ton pipe lengths from their factories to the line position. This transportation is effected by semitrailers fitted with cradles.

In the manufacture of the 88-in. pipe at the works of Hume Steel Ltd., Rydalmere, N.S.W., the general plan is to: (1) form 5-ft sections and weld them longitudinally, (2) weld the 5-ft sections circumferentially to form 15-ft sections and (3) weld the 15-ft sections into the 45-ft lengths that are trucked to the pipeline site for field assembly. High production figures have been attained through skillful plant layout incorporating specially designed fabricating and work-handling equipment. All welding (except that involved in the fabrication of special pipes and bends) is performed with submerged-arc welding equipment.

The proved production capacity of the Hume plant is fifteen 45-ft sections per week. However, steel plates have never been received in sufficient quantity to allow the plant to work to capacity for more than a week or two.

Start with Flat Plates

Steel plates are supplied in mill sizes to nominal dimensions plus ½ in. on length and nominal width plus ¼ in. Plate thickness varies from ⅜ to ½ in. for the 88-in. pipes and from 7/16 to 11/16 in. for the 111-in. pipes.

Manufacture starts with the trimming of the plates to required lengths and widths. This is done by flame-cutting and by a shear specially adapted to the purpose. From the shear, the sheets are moved by roller conveyor to the edge setter, which presses the edges of the plates to the radius of the finished pipe. Crimping the edges in this way prior to rolling is done to insure a true circular cross-section.

Rolling and Welding

Leaving the edge setter, the plates pass through pyramid rolls and are rolled to the pipe diameter. Then the edges are tack welded together with a tight fit-up.

The cylinder thus formed is positioned for welding. The installation comprises two automatic heads, spaced one above the other, for welding the joint on each side. First, the inside seam is welded, the joint being backed up with flux to avert burn-through. The cylinder is then rotated 180 deg to bring the outside of the joint under the top head. With the submerged-arc process, 100% penetration is readily obtained even when welding the thickest plates (11/16 in.).

After removal from the welding fixture, the 5-ft-long cylinder is checked for concentricity over a template gage. Tolerance is ±⅛ in. on the diameter. A copper hammer is used to correct any irregularities.

Joining 5-ft Sections

Three 5-ft cylinders are joined together to form a 15-ft length of pipe. The procedure adopted for this job

6—STRADDLE truck positions a 15-ft anchor pipe. Most sections assembled in the field are 45 ft long

7—WELDED sections 560 ft 6 in. long have expansion joints at the ends and a double support in the center

is to use circumferential butt joints. In the later circumferential welding done to join the 15-ft lengths into 45-ft lengths ball-and-socket type of lap joints are employed. For this reason, two out of every three 5-ft lengths produced have one end expanded to either a socket or a ball.

The 5-ft lengths—one with a socket and a plain end, one with two plain ends and one with a plain end and a ball end—are positioned on the 15-ft assembly jig with their longitudinal joints staggered 12 in. apart. The jig consists of a substantial steel bed on which rollers are mounted to provide accurate alignment of the sections.

The sections are tack welded together with E-6010 electrodes. As with the welding of the longitudinal butts, the first circumferential pass is made from the inside, using a flux back-up. The rubber rollers that support the pipe are electrically driven to rotate it at the desired speed, which varies, of course, with the plate thickness. The travel speed ranges from 12 to 30 ipm.

Making Stiffening Rings

One out of every three 15-ft lengths is fitted with a stiffening ring designed to resist deformation under the concentrated loading at the point of support. The stiffening ring is a rolled H-section. The flanges are rolled from 6 by $\frac{5}{8}$ in. and 6 by $\frac{3}{8}$ in. plates, and the web, 4 in. deep, is flame-cut from 7/16 in. plate. The ring is lap-welded to the appropriate 5-ft pipe length as it comes from the rounding and gaging operation. The particular section with the ring is then returned to the regular production line.

Welding the Ring

The fabrication and fixing of the support ring involves both fillet and lap welding. Figure 4 shows the submerged-arc welding fixture used for this phase of the work. There are two welding heads (one swung out of sight in the picture), which are mounted on arms and pivoted from a tubular column. The web and flanges of the ring are assembled and tack welded, then loaded onto this fixture.

The fixture is designed so that the fillet joints are made in a natural downhand position. The ring is supported by two idler rollers and one variable-speed driving roll. In the illustration (Fig. 4), the welding of the outer fillet is shown. When this is completed, the lower head will be swung aside and the upper head will be swung across into position to weld the inner fillet. The ring will then be inverted for the welding of the fillets on the opposite side.

The same fixture is also used to lap weld the ring to the 5-ft pipe length. The ring is tack welded in position on the pipe and then positioned in the fixture again. The upper and lower heads are used in turn to lap weld both sides of the ring.

When all internal and external butt welds have been completed, the 15-ft pipe length is visually inspected and passed to hydrostatic testing (Fig. 5). The pipe ends are sealed under pressure, and the pipe is filled with water at a pressure equivalent to 8 tons per square inch. While it is under this loading, all joints are hammer tested with a 7-lb hammer. As a final stage, the test pressure is raised to 12 tons per square inch and the pipe examined for signs of distress. Out of four miles of piping completed by this contractor at the present writing, not one pipe has failed under the hydrostatic test.

Cleaning and Coating

Further operations on the production line are to pickle the pipe in acid to remove all scale, thoroughly wash it in slightly alkaline water and treat it in a phosphoric-acid bath. When dry, it is coated on the outside with a thick zinc-base preparation and oven baked at 400 F. This treatment provides a hard coating with excellent corrosion resistance.

For internal protection, the inside surface of the pipe is coated with bituminous material and metal screenings, followed by a layer of concrete approximately $1\frac{1}{2}$ in. thick. The bituminous material is applied hot, while the pipe is being rotated at relatively low speeds on power-driven rollers. The rotating pipe is coated

(Continued on page 64)

VETERAN railroad locomotive is turned into scrap. The hand cutting torch is indispensable in dismantling such equipment

HAND TORCH is also a very useful tool to cut up a large variety of rather light scrap

Flame Tools for Scrap

Scrap too big for the charging box is being cut down to size by hand cutting torches, oxygen lances or (most recent development of all) mechanized flame-cutting.

BY R. F. HELMKAMP AND A. H. YOCH

General Technical Sales Dept., Air Reduction Sales Co., New York City

ANNUAL steel production for military and civilian needs is topping the 100-million-ton mark, yet the iron and steel scrap needed to maintain this production is not reaching the steel mills through routine channels. The demand for scrap steel has increased to the point of becoming a national emergency. At current production rates, 50% more scrap is needed than in the peak year of World War II.

In 1950, 97,800,000 tons of steel were produced; by the end of 1952, 119,500,000 tons are expected. By the end of 1952, steel makers say, 5,000,000 more tons of scrap will be required than were needed in 1950.

A big scrap drive is now going full steam ahead to help meet the needs of accelerated steel production. About 58% of the total scrap required is produced by ingot and casting makers and is known as "home" scrap. the balance of 42% is "purchased" scrap and is procured from outside sources.

This article will deal only with the home scrap.

An important portion of today's available scrap consists of skulls, buttons and other heavy masses of solidified metal resulting from furnace spills and lost heats. Before the development of modern flame-cutting equipment, scrap of the heavy variety meant so little in itself that it was customary to bury buttons and skulls in order to get them out of the way. These are now being dug up again and reduced to charging-box size—usually 18 in. wide, 60 in. long and 18 in. deep.

The buttons, skulls, spills, etc. have for years been a real headache to mill men. Too massive to move readily, too large to fit into charging boxes, these spills and skulls have been piling up in every scrap yard. Their day has now come.

Tools for Gas Cutting

Today, many mills are mining buttons and skulls buried years ago. The reduction of such huge items of home scrap as skulls, spills, etc.—and the trimming down of obsolete, hard-to-handle machinery and equipment or purchased scrap to charging-box size—may be accomplished by three important gas cutting tools:

(1) The oxyacetylene hand torch, alone or with the oxygen lance.

(2) The oxygen lance. For extremely large sections such as a 75-ton open-hearth spill.

(3) Machine gas flame-cutting. Ideal where crane facilities are available and scrap tonnage is high.

Practically any heavy scrapping job, regardless of shape, size or location, falls within the cutting scope of these tools.

Machine Cutting Popular

Today, machine gas cutting, like the manual cutting of scrap, is becoming standard practice. With the cost of cutting methods declining, masses formerly too bulky to handle or too low in value to bother with may be economically retrieved.

There are, however, mill men who are still unaware of the feasibility and economy of heavy scrap cutting. And there are others who have adopted elementary flame-cutting methods but who do not appreciate the economy of improving upon those methods with mechanized cutting equipment. We hope that they may be reading this article.

The metallurgist of today who oversees the production of steel in-

OXYGEN lance penetrates 10 ft of steel to sever 75-ton skull

COMBINATION lance and torch method slices up heavy scrap effectively in cases where handling is a problem and high maneuverability is needed

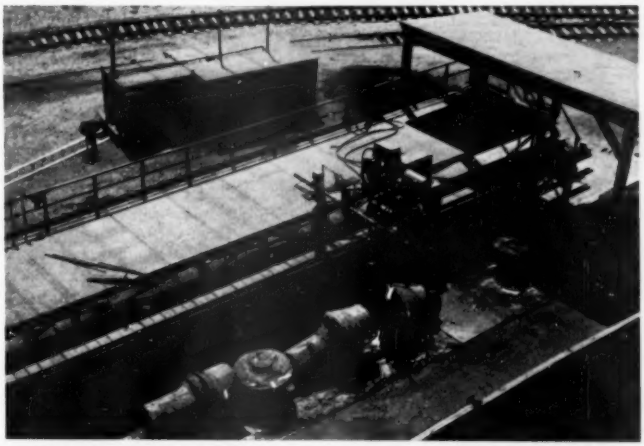
Cutting

gots out of pig iron and reduced scrap is a far cry from the alchemist of yesteryear who tried to make gold out of pewter and common metals. Where the latter failed, the former has succeeded—because his objective is more reasonable and his methods are scientific. He has succeeded so well that the profits easily absorb the cutting cost preliminary to ingot output.

Gas Cutting Costs

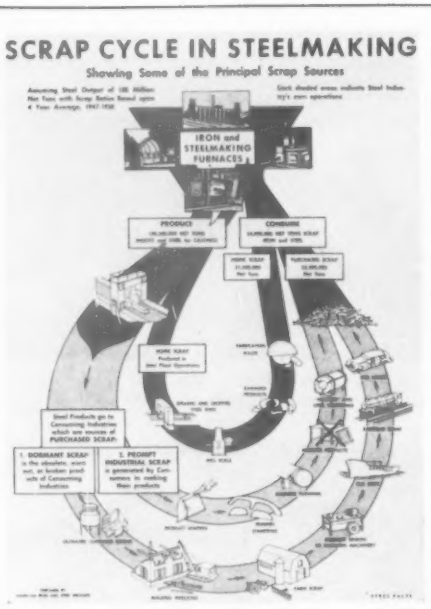
Scrap cutting costs in general differ widely. Hardly any two jobs are ever handled the same. The use of power shears for reducing thin plates and bars to charging-box size, the turning over of usable materials uncut such as pipe, shafting, pulleys, gears and other mill equipment, introduce unknown factors in the cost per ton that can only be guessed at. The costs of oxygen and fuel gases differ widely also, depending both on the volume consumed and the location of the user. With large-volume users, economies have been introduced through the distribution of "bulk" oxygen—either from specially designed trucks and trailers or by direct pipeline from the supplier's plant for short distances.

The general economy and practicability of scrap cutting with oxygen may perhaps best be told by several specific examples. Although



MACHINE CUTTING is the fastest method. Here the scrap is loaded on flat cars and moved under the oxygen jet of a machine on elevated rails

HEAVY-DUTY machine torch reduces a massive steel button to proper size



Where Scrap Is Found

SCRAP is one of the two principle sources of metal in the making of steel. About as much scrap as pig iron is used, on the average.

The diagram at left was prepared by the American Iron and Steel Institute to show some of the ways in which iron and steel scrap is created. Scrap is worn out, broken or discarded items containing iron or steel; pieces which remain after automobiles, refrigerators or other products are made; croppings and other waste produced by the steel mills themselves during the rolling of steel. All of this has to be sorted, cut to convenient sizes or made into compact bales and placed in charging boxes to be taken to the furnaces.

Obsolete machinery and equipment in industrial plants and on farms, abandoned pipelines and railroad tracks, battlefield scrap, obsolete ships and war material, surplus machinery and equipment now outmoded, old automobiles and trucks rusting away in wrecking yards in every section of the country . . . these are some of the sources of major importance to steel production. But all of the purchased scrap together totals less than the home scrap, produced in steel plant operations (22,500,000 as compared to 31,500,000 net tons).

these differ in detail, they all have in common an accelerated preparation of scrap tonnage for the steel mills.

TORCH AND OXYGEN LANCE

The oxyacetylene cutting torch, manually operated, is an indispensable tool for reducing a large percentage of scrap of the purchased variety, for dismantling obsolete equipment and machinery and for scrapping objects too bulky to be readily handled. The hand torch is wholly satisfactory where weight and thickness are not too great for complete penetration and where a high degree of torch maneuverability is necessary.

Do not underestimate the penetrating capacity of the hand cutting torch. A broken drop ball at the plant of a large steel mill was successfully scrapped by this method. The depth of the manual cut was 34 in.

The cutting of foundry spills and other steel masses beyond the scope of the manual torch alone can be accomplished with the oxyacetylene cutting torch and the oxygen lance in coöperation. In this sort of teamwork, the torch leads the cut and the lance penetrates the kerf. Two operators are necessary. This combination of cutting torch and lance has been successfully employed in the severing of casting risers up to 90 in. in diameter. The combination method is particularly useful where a mixture of steel and slag is to be severed, since the oxygen lance will cut through nonmetallic interruptions in the steel mass. A free flow of cutting slag from the kerf is assured by the oxygen lance.

The oxygen lance may also be used without the hand cutting torch. A large steel mill was experiencing difficulty in obtaining sufficient scrap to keep four of its seven open-hearth furnaces in operation. A gas flame-cutting specialist recommended the use of the oxygen lance to salvage the open-hearth spills, skulls and lost heats that had accumulated in the yards during the years. Approximately 900 tons of scrap were cut up in less than a month.

An open-hearth spill, measuring 10 by 5 by 15 feet, was sliced by the oxygen lance into proper size for charging. This piece weighed approximately 75 tons. It was severed in 24 hours by the oxygen lance with the consumption of between 20,000 and 25,000 cu ft of oxygen. Because the spill was a mixture of steel, brick and slag, it was cut more easily by feeding old nuts and bolts into the cut ahead of the jet.

Some steel mill men have learned an even better way of getting a big job done. For example:

MACHINE CUTTING

A large steel mill was using the cutting torch and lance method to reduce heavy scrap to charging-box size. Cutting specialists interested this company in a machine installation to expedite operations and to reduce costs.

The equipment consisted of a portable motor-driven carriage with a water-cooled bar and an appropriate torch with heavy-duty cutting tips. The entire motorized torch unit was mounted on a jib crane, which was attached to a crane column in the scrap yard at a point convenient to crane service. The jib crane was arranged so that it could be raised or lowered by means of a one-ton electric hoist mounted on the column, thus allowing the torch to be positioned to suit the height of the work.

For machine cutting of skulls and similar heavy scrap, experience indicates that an average of approximately 500 cu ft of oxygen and 50 cu ft of acetylene is consumed per ton. Pressure of the cutting oxygen is 20-25 psi, and acetylene pressure is 10 psi.

Formerly, this particular mill averaged only 150 tons of heavy scrap per month, not all of which was cut to charging-box size. Oversize pieces could not be charged until the front walls of the open-hearth furnaces were torn down. Now the average is 500 tons of heavy scrap per month, all of it cut to charging-box size. Whereas it used to take two days to cut a button, the same job is now done in 15 minutes with machine cutting.

Another scrap yard has to cut 3½% nickel plate ranging in thickness up to 15 in. This concern now employs a portable straightline cutting machine traveling on a track. A three-hose torch, using appropriate cutting tips, is supplied with oxygen from a 15-cylinder manifold. The amazing economy of approximately 80 cents per ton for gases was realized in this operation. One hundred tons of scrap a day is easily cut.

In another yard, skulls and spills ranged in weight from one to 30 tons and varied from 2 in. thick at the edges to a good 4 ft thick in the centers. This scrap was reduced by a straightline cutting machine equipped with a heavy-duty water-cooled torch and related equipment.

The same set-up was used to cut steel mill rolls, largest of which was 50 in. in diameter. Like the spills and skulls, the discarded rolls had always occupied valuable space as hard-to-dispose-of scrap.

Does Away with Blasting

An eastern steel mill had been lancing and blasting with dynamite to reduce its heavy scrap. A time-study indicated considerable loss of man-hours caused by clearing the area for blasting. Moreover, the large number of buttons, skulls, spills and forging butts represented a tough handling job even with cranes. These irregular masses weighed about 15 tons each and ranged from 2 to 6 ft in thickness. They were being mined from buried scrap that had accumulated over a period of 50 years and were also being produced by current mill operations.

These huge scrap formations were prepared for the charging box in the following manner:

An old cutting machine left over from World War II was mounted on elevated rails and equipped with a heavy-duty torch. A motorized torch holder, made specially for the torch, was mounted on the torch bar, and a special tracing device with remote controls was also built.

This arrangement affords any direction of cut on the horizontal plane —straight, diagonal or V-shape. The torch can also be lowered or raised vertically by a motorized unit to accommodate the contours of the scrap.

The heavy scrap to be cut is loaded by crane on flat cars prepared with a bed of slag and scale. Then the scrap on the flat cars is moved under the "knife" of the cutting machine. The cuts are made just short of complete penetration to prevent the huge masses from falling in the wrong direction or into positions that would require additional handling.

The next operation is to dump the cut-but-unsevered scrap from the flat cars into a breaking pit. A crane lifts a 15-ton ball and drops it on the scrap, thus completing the severing by impact. This operation, which has been underway for more than a year and is likely to continue for an indefinite period, is resulting in an enormous recovery and preparation of scrap tonnage. Moreover, the savings in time and money cannot be ignored.

The Scrap Drive

The appropriate application of flame-cutting techniques in the preparation of scrap for steel production is, we have seen, a significant factor in the ultimate success of the current scrap drive. Underlying this factor is the drive itself—in support of which top management in many industrial plants has appointed committees to turn up every available bit of dormant steel and iron.

These plant campaigns, internally organized and conducted, are backed up by visiting sales and technical representatives of many steel-supporting industries who, incidental to their normal function of selling and advising, point out dormant scrap which the customer has missed in his own campaign.

One salesman reportedly turned up 45 tons of obsolete tools and machinery in an eastern plant during an afternoon's visit.

Organized campaigns, as well as the spontaneous participation of citizens who contribute "junk" around the home, promise to produce a substantial portion of the extra scrap needed for the open-hearth furnaces during the critical years that lie ahead for us.

Machine-Cutting Data for Steel of Constant Thickness

Metal Thickness, in.	Drill Size of Orifice		Pressure, psi		Speed, ipm	Gas Consumption, cu ft per hr			Width of Kerf, in.
	Cutting	Preheat	Oxygen	Acetylene		Preheat Acetylene	Preheat Oxygen	Total Oxygen	
12	10	53	30	6	4	132	145	1,325	0.39
14	2	53	25	6	4	162	178	1,428	0.44
16	2	53	30	6	3½	162	178	1,753	0.44
18	¼ in.	53	25	8	3½	220	242	1,932	0.50
20	¼ in.	53	30	8	3	220	242	2,192	0.50
22	¼ in.	53	34	8	3	220	242	2,452	0.50
24	L	52	24	10	3	272	299	2,574	0.58
26	L	52	29	10	3	272	299	2,879	0.58
28	L	52	33	10	3	272	299	3,184	0.58
30	Q	51	23	13	3	347	382	3,182	0.66
32	Q	51	27	13	2½	347	382	3,582	0.66
34	Q	51	31	13	2	347	382	3,932	0.66
36	Q	51	35	13	2	347	382	4,282	0.66

2—RECEPTIONIST "Teddy" Kennedy points out brazing on a gas-engine clutch plate to Writer Fred Burt

3–CONVERTED grease guns apply copper paste to a three-piece assembly for small aircraft clutch plate

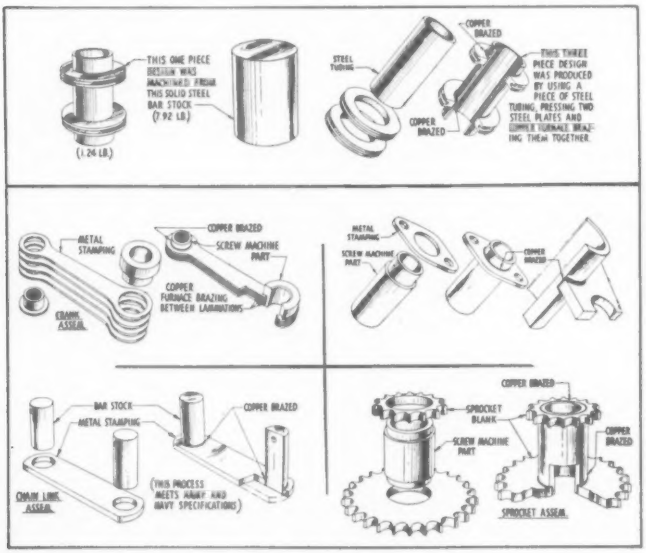
Modern Methods

What should be brazed? Materials, advantages, sizes and shapes, limitations and economies of production furnace brazing are discussed in this excellent article.

BY FRED M. BURT

IN PLANNING this article, the writer chose Fabriform Metal Products, Inc., as the best source of facts, figures and illustrative material on copper brazing. It was an easy selection. The largest volume of the greatest variety of units copper brazed in the far western states passes through the Fabriform plant at 7720 Maie Ave., Los Angeles.

During a typical month, Fabriform does about 600 different jobs for some 150 customer companies. These may involve the copper brazing of from 100,000 to 150,000 assemblies, each having from two to ten components.

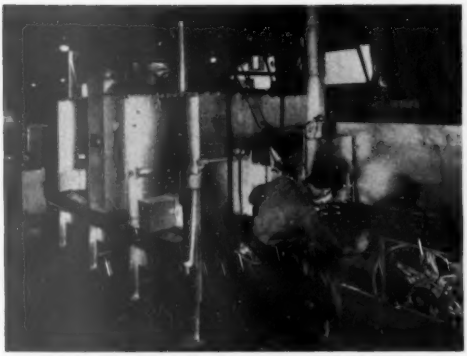


1—HOW STAMPINGS and machined parts may be joined by furnace copper brazing. The sketches suggest only a few of the things that can be done

Some Typical Parts

The small drawings grouped together as Fig. 1 are reproduced to show examples of stampings and machined parts joined by copper brazing. Of particular interest are the two drawings at the top comparing a one-piece with a three-piece design. The original one-piece part was machined from solid bar stock, while the three-piece design uses two machined rings and a piece of tubing. In one day's production, the three-piece design saved 1,000 lb of steel and 60% of the machining time formerly required.

Sample parts on display include stampings furnace brazed to flat steel, stampings brazed to steel rivets, stampings brazed to steel tubing, stampings brazed to other stampings, identical stampings stacked upon each other and brazed to form laminated parts, formed tubing brazed to screw machine parts and forgings brazed to screw machine parts. There is virtually no limit to the number of combinations that may be effected.



4–GOING IN! Five-part assemblies for V-belt drive pulleys enter the preheat chamber of electric furnace

5–COMING OUT! Brazed pulleys are inspected as they emerge from cooling zone through a flame baffle

for Copper Brazing

The Fabriform plant lobby (Fig. 2) is well equipped with illustrative material, brochures, samples and (under glass on wall to left of picture) reprints of articles relating pertinent facts about copper furnace brazing and other production methods.

As further evidence that this company is a leader in developing and advancing the techniques of copper brazing, we might mention that it was in this plant that the use of copper in paste form was first made up and used successfully. The paste is applied with converted grease guns (Fig. 3). These prepared copper pastes are now produced and sold commercially through arrangements with Fabriform Metal Products.

Equipment for Brazing

The company's equipment for copper brazing includes four controlled-atmosphere furnaces, two of which are box-type and two continuous. The continuous furnaces have conveyor belts of nickel-chrome alloy. Parts traveling on the heat-resistant mesh belt into a 45-ft-long, 100-kw electric furnace are pictured in Fig. 4. These assemblies are V-belt drive pulleys (five parts to be joined). They first enter a small preheat chamber, at the entrance of which a gas flame is provided as a baffle against the entry of oxygen. Next to the preheat chamber is the hot zone, 11 ft long, after which comes a 25-ft cooling zone. Another gas-flame baffle for oxygen guards the furnace exit (Fig. 5).

For silver brazing, the company has three high-frequency induction heaters, of 18 and 20 kw, and a salt pot for dip brazing. Each of the induction heaters has a two-station worktable. In Fig. 6, Roy Marshall, silver-brazing foreman, is assembling aircraft hose couplings—each made by joining together two types of fittings.

Though the use of copper furnace brazing is rapidly growing, it seems to this writer (who has written on the subject before and who has read most of the other articles about it) that not as many production men and engineers as should, know the advantages. There are many highly diversified assemblies that could be integrated most efficiently by furnace brazing and are not being so produced.

Get Expert Advice

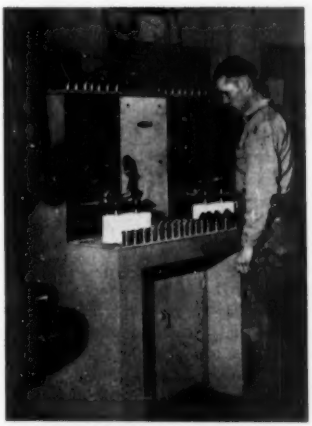
One point that must be stressed is this: consult an engineer thoroughly versed in copper-brazing techniques before the designs of component parts and their relations one to another are completed. When this is done, the final design will be suitable for application of copper brazing in the most efficient manner. When changes are indicated, generally only very slight design modifications are required, in no way impairing the suitability of the end product.

Questions and Answers

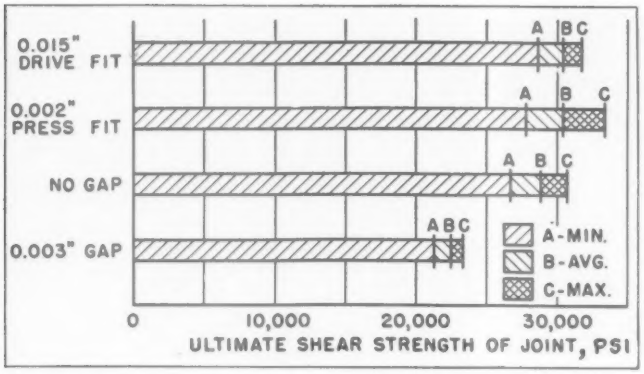
The following questions are among those most frequently asked of Fabriform's field sales engineer, Al Thompson. The answers are Thompson's:

Q. What materials can be copper brazed?

A. Low-carbon steels, irons and many alloy steels (except chrome alloys over 2%). Any of these ferrous materials can be brazed to the same material or to any of the others.



6–INDUCTION heaters are used for silver brazing at Fabriform



7–EFFECT of tightness of fit on strength of copper-brazed joints in low-carbon steel. In general, the tighter the fit the stronger the joint

Q. What are size and weight limitations?

A. For the continuous furnaces, the size limitations are 10 in. in height, 20 in. in width and about 6 ft in length, with the unit weighing not over 10 lb per lineal foot (these approximations can be exceeded a little if necessary). In our box-type controlled-atmosphere furnaces, larger units can be accommodated—up to 24 in. high, 30 in. wide and 96 in. long, with weight up to a maximum of 200 lb.

Q. What fits should be used between components to be copper brazed?

A. The ideal is a tight fit to a shoulder or a tight press fit. Other good ones are compression (spring) fits; screw fits; fits machined to close accommodation and then knurled to a press fit. Many loose fits (such as common slip fits) may be satisfactorily copper brazed for certain usages not requiring maximum strength. The strength of any copper-brazed joint is pretty much proportional to the tightness of the fit (see chart, Fig. 7).

Joint strength is also affected by the nature of the surfaces joined. Ordinary machining normally leaves a satisfactory surface for copper brazing. Often one or both surfaces are shotblasted to obtain the maximum joint strength. It goes without saying that the surfaces must be free of grease, dirt, scale or other foreign substances.

Q. How are outer components held in position?

A. By gravity, compression, arc or spot tack welding, riveting, pinning. Another method is to turn to loose fit and then knurl or serrate the part to secure a tight interference fit.

Q. How is the copper applied?

A. Principally in the form of wire of the proper size. The wire is preformed into rings, slugs or any other shape indicated. We also use a copper paste applied with a small hand grease gun and occasionally copper in leaf or strip form. The quantities used are based on the expert experience of the technicians supervising or doing the work of preparation. The copper melts and makes a homogeneous bond with the parent metal in each side of the joint.

Q. Is copper applied from both sides of a joint?

A. Normally, never in this plant. There is a very important reason for one-side application. When the brazed part comes out of the furnace, we look immediately to see if copper shows on the other side of the joint. If it does, that is proof that there is a 100% bond. Such an indication obviously could not be obtained with a two-side application.

Q. How can we limit undesirable creeping of the brazing metal over adjacent surfaces?

A. Slightly roughen the surfaces to be joined by shotblasting and then polish the adjoining areas. The copper will not creep out onto the polished surface. One of the best methods of doing the polishing is by ball burnishing with honite. On many copper-brazed assemblies, creeping would be of no importance; therefore, no attention should be paid to it. There are other cases, however, where creeping may be undesirable because of its effect on the appearance of the finished product or, in case the surface is to be welded, the slight copper coating might cause difficulty with the welding to result in leaks.

Q. Will parts come out bright and shiny?

A. The parts will generally come out brighter than when they went in. When the brazing is done in a controlled reducing atmosphere in an electric furnace, the metal surfaces will not scale or oxidize even after removal from the furnace. If any surface had a coat of black oxide when it entered the furnace, the deoxidizing action of the furnace atmosphere will remove the coat to make the surface brighter.

Q. Can parts be case hardened or otherwise heat treated after furnace brazing?

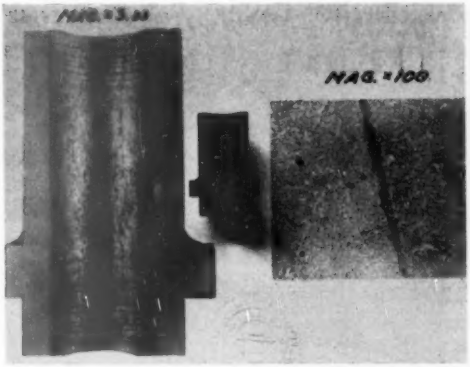
A. Yes. Case hardening or heat treatment can normally be done at temperatures under the melting point of the copper bond, which is somewhere between 2,000 and 2,050 F.

Q. Are preheating or stress relieving necessary?

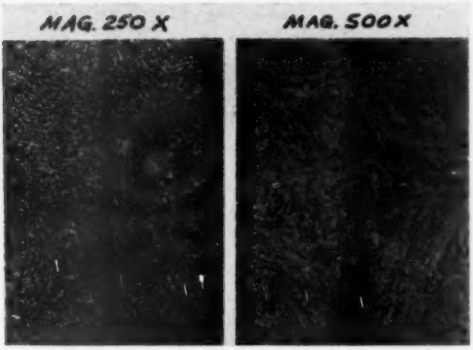
A. As separate operations, no. In our continuous furnace brazing, the assemblies are preheated in a special chamber before they move into the full-heat (soaking) chamber. After passing through 11 ft of full heat, they enter a 25-ft cooling chamber, which provides a stress-relieving heat treatment in a controlled reducing atmosphere. The long, slow cooling effectively relieves any stresses that may have been set up because of differing techniques and materials of adjoining components. In some instances, it also corrects little deformations that may have been caused by these stresses. Deformation, however, is kept to a minimum through the slow heat rise and the gradual cooling. The conveyor belt has a variable-speed drive, so that the proper speed may be set for each brazing job as well as the right furnace temperature.

Q. Lastly—one of the most common questions—when can we get our parts?

A. The Fabriform plant operates 24 hours daily, six days a week. One-day service is given on a very large number of the jobs that come in, particularly if not much modification is required in the preparation department. Two-day or three-day service is rendered on most other jobs, dependent upon urgency, problems of preparation, size of run and other variables. One-week service is the maximum,



8–VERTICAL copper-brazed joint not magnified (in center) and magnified as per labels at left and right



9–SAME joint as in Fig. 8. Note the homogenous transition zone between the parent and brazing metal

even where preparation and production problems are the most adverse, unless the component parts cannot be assembled and properly brazed without returning them to the customer for some modification. Any instance like this would point out the extreme advisability of consulting the field engineer before the parts were sent in.

Thank you, Mr. Thompson. We were glad to have you with us on our program. And now for a few more facts about furnace brazing.

Joint Strengths High

The most commonly used furnace atmosphere is a mixture formed by the partial combustion of natural gas and air. The ingoing gas and air pass through flowmeters and control valves to a motor-operated mixing pump that further controls the input ratios and pressures. The gas-air mixture is burned through a catalytic bed within the combustion chamber; the products of combustion then pass through condensers or driers to remove any moisture or other impurities and thence into the furnace and cooling chambers.

The great strength of a copper-brazed joint produced in a furnace is something of a puzzle to the experts since it is considerably better than the strength of the copper and compares well with the strength of the steel. The shear strength of joints in steel assemblies where copper is used as the brazing medium normally ranges from around 27,000 psi up to 35,000 psi when the parts are assembled with the ideal manufacturing tolerances. Even for a joint with a large gap, shear strength may be around 22,000 psi. The shear strength of copper is around 20,000 psi and the shear strength of mild steel around 30,000 psi.

One of the explanations advanced for the high strength of the furnace-brazed joints is that a knitting or growing together occurs within the joints when the parent metals are in intimate contact, as is caused by a tight fit. The knitting action is further enhanced by the formation of alloys of the brazing medium and the parent metal.

In this connection, let us look at some joints under the microscope. Figure 8 shows a vertical copper-brazed joint not magnified (center) and magnified 3.33 times and 100 times as labeled. In Fig. 9, the same joint is magnified 250 X and 500 X. These photomicrographs show the thorough transfusion between parent and brazing metal that results in a homogeneous copper-iron alloy throughout the joint.

Tightness and Tolerances

In making parts for a copper-brazed assembly, normal manufacturing tolerances are generally satisfactory. There are certain dimensions, however, that must be adhered to in the making of all parts. Prior to the actual brazing, an effort should be made to have snug metal-to-metal fits. A tight fit assures the most strength in the joint and also prevents the parts from moving as they travel through the furnace.

As tightness increases, it is also necessary to increase heating time to allow the copper to flow through the joints. Extreme tightness is objectionable because of the tendency to stress and distort the parts during assembly.

The most satisfactory limit to follow for a maximum press fit is 0.001 in. per in. of diameter. At the other extreme, the maximum gap in the joint is 0.003 in. Such large gaps, however, are only permissible in certain types of parts and joints. Each job should be studied to determine its own proper fit.

Reasons for Copper Brazing

There are seven good reasons why copper furnace brazing has proved its value as compared to other methods of joining. These are:

1. A high rate of production.
2. The excellent appearance of brazed assemblies.
3. The parts are fully stress relieved.
4. Heat treatment can be done after copper brazing.
5. Great strength is obtainable.
6. Assemblies composed of many pieces of various shapes and thicknesses and different materials can be copper brazed in one trip through the furnace because of the uniformity of heat.
7. Complete assemblies may use components of standard units (possibly combined with special parts) for a large saving in production costs.

There is no necessity for customers of Fabriform to gamble on copper brazing. The company has a well organized, systematic plan to provide information. An analysis by the ex-

perienced field engineer will bring forth an objective opinion with advice as to parts modifications, if any are required, to cut brazing costs and secure a better quality of jointures. If there is any doubt in the field engineer's mind, the uncertainty is easily removed by copper brazing a sample assembly and making the tests of joint strength, dimensional accuracy, shape precision, appearance, etc. At the same time, it can be determined whether or not there are any adverse production factors.

In addition to its copper-brazing and silver-brazing operations, Fabriform Metal Products, Inc., does bright annealing, applies organic finishing, bends tubing, prepares parts for these production operations and makes the necessary tests and inspections. The company principals are Mario R. Glick, general manager (a partner), Kenneth L. Glick, design engineer (partner), Pauline Glick, office manager (partner), Al Senechal, production superintendent, and A. M. Thompson (previously referred to as "Al"), field sales engineer.

Plant and Equipment

The main building, 8,550 sq ft, houses the company offices, locker and washrooms for the 35 employees and most manufacturing operations. Some machine tools, tube and extrusion bending equipment and one box-type electric furnace are housed in an adjoining 4,000 sq ft building. There is also a 2,500 sq ft warehouse.

The company's working equipment has been conservatively appraised at a value of $264,000, a relatively large investment for this type of production and one that can be profitably justified only by 24-hour daily operation. Equipment in addition to the furnaces and induction heaters previously described includes: arc welders; spot welders; drill presses; punch presses (to 65-ton capacity), pneumatic and hydraulic presses (to 75-ton capacity); tube-bending machines; bench, pedestal, face and abrasive belt grinders; engine lathes; arbor presses; a sandblast machine; tube deburring equipment; oxyacetylene outfits for welding, brazing and cutting; an expanding mandrel swaging machine; a 14-in. band saw and abrasive cut-off saws. For organic finishing, there are spray booths and baking ovens served by overhead conveyor.

Keeping up with the Taxes

No. 5: Casualty Losses

BY HARRY H. ROSE

As a partner in the public accounting firm of Traeger & Rose, Cleveland, Harry Rose is an authority on "down-to-earth" tax law.

MANY readers may not be aware that casualty losses are deductible by the non-business as well as the business taxpayer. The Code defines casualties as "losses of property from fire, storms, shipwreck or other casualty, or from theft" (Sec. 23(e). The decisions hold that casualty losses must arise from some sudden, unexpected or unusual cause (54F(2)537). This excludes progressive deterioration of property through a steadily operating cause (120F(2)253). Briefly, casualty connotes suddenness. For the non-business individual, the casualty deduction is confined to damage to the taxpayer's own property; damage to the property of another or for personal injuries to self or to another are excluded. For the business taxpayer, all such losses are deductible whether technically classifiable as a casualty loss or not.

For both business and non-business taxpayers, the losses allowed are:

Fires.

Auto accidents: deduction permitted if due to faulty driving of self or other person driving taxpayer's car but not if due-to wilful act or negligence of taxpayer; also deductible if due to faulty driver of another car. Same for a pleasure boat (Sec. 23 (e)1). Damages were deductible when auto was in unauthorized use by taxpayer's chauffeur (16 F(2) 995). By a quirk of the law, ordinary negligence (faulty driving) is not a disqualification for an auto casualty deduction (Sec. 23(e)1), but it is for any other kind of casualty (Stevens, TCM 12,338-1947).

Freezing of motor (16 F(2)995).

Bursting of hot water boiler in residence (IT 2231).

Damage caused to residence by freezing and bursting of water pipes (OD 1076).

Sinking of land under residence caused by a subterranean disturbance (30 BTA 1028).

Damage to trees on residential property from storm and freezing (73 F Sup 70).

Payment by lessee of residence to lessor for fire damage when bound to return the property in as good condition as received (IT 3850).

Floods. A flood is considered as "other casualty."

Loss by drought (Buttram, USDC, WD Okla. 1-30-43).

Losses disallowed for the non-business individual but fully deductible if pertaining to the taxpayer's business or transactions engaged in for profit are:

Damage to property of another or personal injuries of another. There must be a loss of taxpayer's property (16 BTA 1331).

Damage to household goods in storage or in transit was held not to be the result of any sudden, unexpected or unusual cause but was more on the side of the commonplace and the usual (Bercaw, TCM 7263-1947).

Damage to residence by excavation on adjoining property was held not "other casualty" (9 BTA 1402).

Damage from termites or loss by rat infestation was regarded as progressive and not sudden (16 TC 163; Banigan, TCM 28619-1951). Nor is progressive deterioration of residence due to faulty construction a casualty loss (54 F(2)537).

Expense of defending suit for taxpayer's alleged negligence is not a casualty (ARR 444).

Country home condemned as site of flood prevention construction not allowable (ARR 1819).

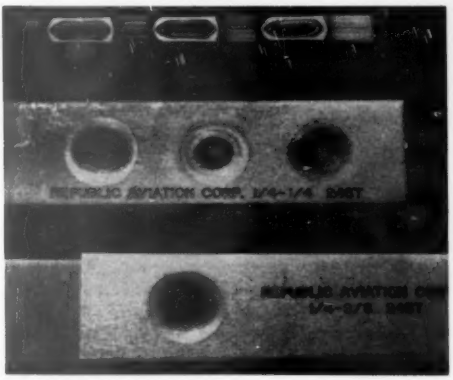
Passerby tripped over wire in front of taxpayer's home—disallowed as damage paid to another. (OD 779).

Vandalism is not a casualty loss (Banigan, TCM 28619-1951).

Time for Deduction: Controversy often arises as to when a casualty loss is deductible. The loss should be deducted in the year of the casualty (101 F(2)44), to the extent not compensated for by insurance.

Joins Heavy Aluminum

High-strength alloys can be spot welded in combinations up to 1/4 by 3/8 inches



SAMPLE test welds—explanations are given in the text

REPUBLIC record: over 80 welds per minute on wing skins

WHAT is said to be the "world's biggest spot welder" was recently put in operation at the Republic Aviation Corp., Farmingdale, Long Island, N. Y. Its job is to join high-strength aluminum alloys in combinations of thicknesses up to 1/4 to 3/8 in. It is also averaging more than 80 spot welds a minute on wing skins—believed to be a record. On internal structures not subject to aerodynamic stresses, Republic has welded up to 100 spots per minute.

The left illustration on this page reproduces photographs of typical specimens. At top is a cross-section of the interior of a 1/4 in. to 1/4 in. weld. Center picture is a top view of three 1/4 in. to 1/4 in. welds before they were cut for internal checking, while at bottom is a 1/4 in. to 3/8 in. shear test specimen in 24ST aluminum. Welding of the latter thicknesses of high-strength aluminum alloy is believed to be a record achievement.

The 80-per-minute rate of spot welds on high-strength aluminum-alloy wing skins compares with the highest reported rate of fastening by riveting of 15 per minute, and that rate involves automatic riveting, which is much faster than manual riveting. Chief drawback to riveting is the multiple operation required, including hole drilling and countersinking or dimpling, as against the single, spot-welding operation. Bolting is likewise expensive and also weakens cross-section structure.

The big new spot welder is of the three-phase frequency-converter type and is featured by bigger and better air regulators and pressure gages, thus making possible finer control of pressure. Other improvements, in technique, were developed by Republic personnel under Chief Tool Engineer Adolph Kastelowitz and Chief Welding Engineer Terence Imholz.

* * *

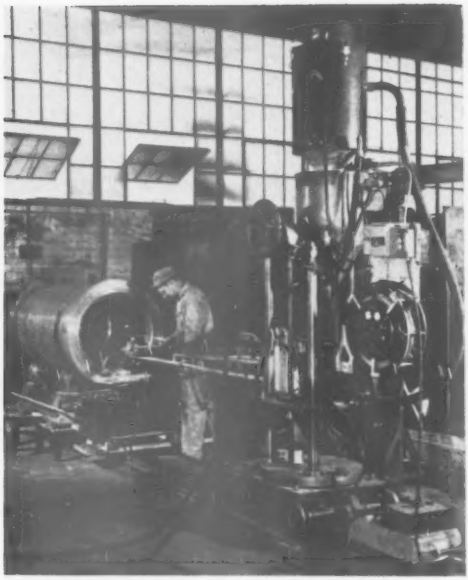
Republic's spot-welding program contemplates its eventual use in place of bolting. The fact that both riveting and bolting weaken structure through the removal of material when holes are drilled has gained added significance with the advent of very high-speed aircraft, which are subject to hitherto unprecedented aerodynamic stresses.

According to Republic's current plans, spot welding will be extensively employed in the forthcoming F-84F, a swept-wing fighter-bomber said to exceed in every category the Korean battle-famed F-84E "Thunderjet."

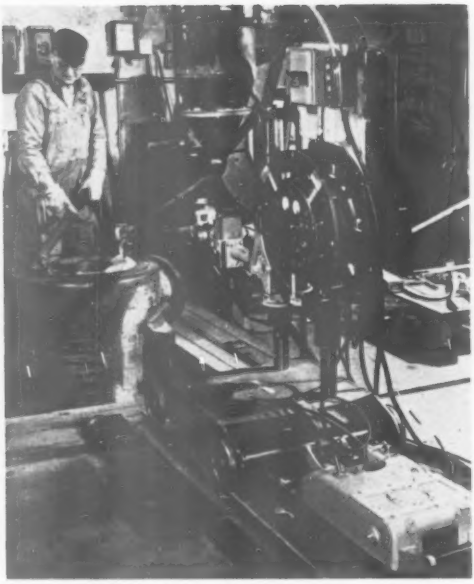
The chief criticism of spot welding—that it may not insure uniform quality—has not been found justified at Republic, which has made extensive studies over a three-year period. Welds joining two 1/4 in. thicknesses have withstood loads of 10,500 lb per spot, while welds in which a 1/4 in. thickness was joined to a 3/8 in. thickness have withstood 14,000 lb per spot.

Maximum thickness commonly spot welded during World War II was 0.065 in. Republic began its experimentation following the war with investigation into the feasibility of spot welding aluminum alloys above 0.081-in. thickness. When the new three-phase frequency-converter spot welder was purchased, its top capacity was specified to be 3/16 in. to 3/16 in. Refinements in the equipment and technique have enlarged this capacity to the present 1/4 in. to 3/8 in.

Next to the Republic welder, the second biggest spot welder known to exist is owned by the United States Navy, which has it in operation at Norfolk, Va.



1–BOILER feedwater pump: welding stainless end ring into outer barrel by the submerged-arc process



2–SUBMERGED-ARC installation is also used to deposit a stainless overlay within bore of the barrel

Pumps and Oil-Field Tools–I

Problems of the pump and oil-field tool manufacturer involve procedures for welding the high-tensile, heat-resistant and corrosion-resistant alloys.

BY F. R. DRAHOS
Metallurgist, Byron Jackson Co., Los Angeles

IN SELECTING the materials used in the manufacture of centrifugal pumps, the pump designer must consider not only strength requirements but also resistance to corrosion, abrasion, fatigue and impact over the range from subzero to elevated temperatures. Among the large variety of materials used for pump construction may be mentioned carbon and low-alloy steels, high-tensile steels, practically all of the stainless group, "Hastelloys" (nickel-base alloys), Inconel, Monel and many others.

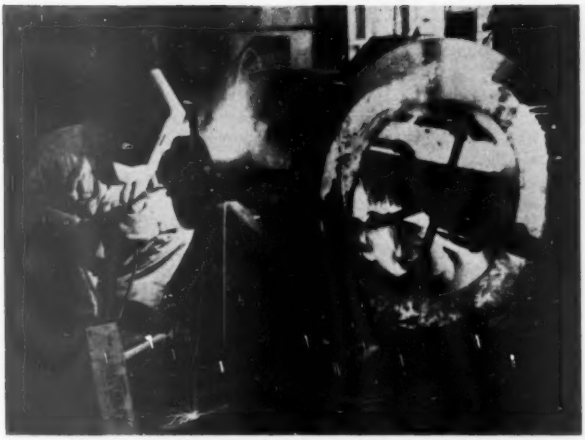
Each of these materials requires a filler rod to duplicate as closely as possible the physical or chemical properties of the base metal. Exacting control must be maintained on filler rod material, joint design, welding procedure, the operator's ability and the physical, chemical and thermal characteristics of the base metals.

Our first example is a double-case boiler feedwater pump, used where boiler pressures are 100 psi or higher or where temperatures exceed 300 F or under both conditions. This pump consists of a split-volute or inner casing, which is inserted into a cylindrical outer shell or barrel. The outer barrel may be of forged or cast low-carbon or stainless steel, depending on the use for which the pump is designed. The barrel also varies in weight, again dependent upon service requirements, from a few hundred pounds to as much as 6,000 lb when finish machined. Wall sections may range from 2 to 6 in. in thickness. Typical forgings for the outer barrels and covers are of AISI E-1020 carbon steel and may have a rough-forged weight up to 10,000 lb. The forging will go through about five machining operations, which include turning of the OD and ID, preparing of the end-plate bevel for welding and milling of the nozzle openings.

End Ring to Barrel

On the larger-size pump, one end of the outer barrel is forged with an opening 10 to 14 in. smaller than the bore. Into this opening, an end ring of 410 stainless is welded. Both the stainless end plate and shoulder of the carbon steel barrel are beveled to make a welding vee 1 in. wide by 1½ in. deep. The welding itself is done by a submerged-arc head mounted upon a specially designed gantry-type fixture (Fig. 1). This single-vee end-plate weld is completed in 1 hour 23 minutes, as against the 10 hours required with previous manual arc welding. Twenty-five pounds of 3/32-in. 410 wire are deposited in 20 passes without stopping. Subsequent improvements in the fixture increased the versatility and reduced the responsibility of operating personnel.

The submerged-arc process is also



3–WELDING a stainless-steel discharge nozzle to pump barrel of 1020 carbon steel. Gas burner inside barrel maintains the preheat

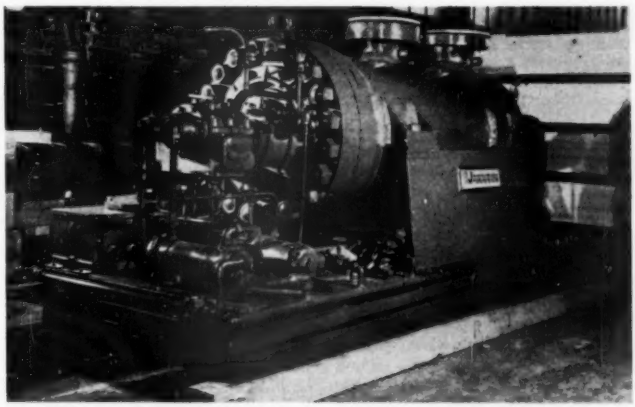
4–FLANGE, welding elbow and spacer ring welded to form a discharge nozzle

used to deposit an overlay of stainless steel within the bore of the barrel (Fig. 2). The barrel forging is fastened to and driven by a standard welding positioner, while the near end is supported by turning rolls.

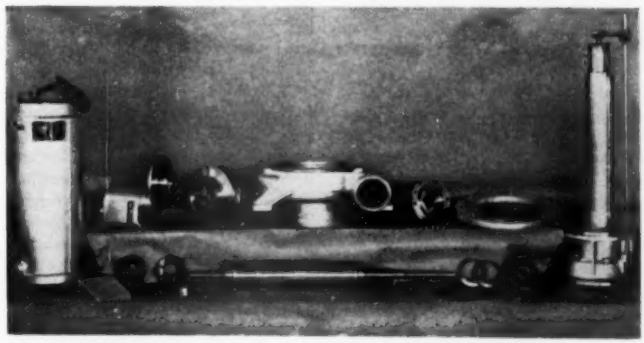
The purpose of this overlay is to prevent any corrosion at areas where the inner volute fits. When made on E-1020 carbon steel, the overlay is deposited without any type of preheating. Special extension nozzles of various lengths were made to reach into the interior of the barrel. Between 20 and 120 lb of type 308 stainless weld metal is deposited, the quantity being dependent upon the overlay desired. Flat overlapping beads are deposited with minimum dilution. The deposition rate is approximately 20 lb per hr, as compared with 2 lb per hr by conventional manual welding methods.

The desirable features of this submerged-arc installation are:

1. The vertical, adjustable platform to raise or lower the welding head.
2. The flux is fed by air pressure to the weld through a tube that is also a strength member of the beam extension.
3. The unused flux is sucked back to the flux reservoir by the vacuum attachment directly connected to the flux chamber.
4. The entire unit is mounted on a bridge and can be moved to either the horizontal or the vertical station while work is being set up at the other station.



5–HERE is the completed boiler feed pump, progress of which was pictured in Figs. 1, 2, 3 and 4. The base plates were also weld-fabricated



6–COMPONENTS above are for a "stuffing-boxless" pump, a different type from the one in the first five pictures. Materials to be joined in this job include low-carbon steel, type 302 stainless steel and Inconel

7–FOUR castings were joined by welding to make a crossover cover

5. The welding carriage is synchronized with the speed of the positioner. As each lap is completed, the carriage automatically moves the proper distance for the next overlapping bead. The carriage travel may also be adjusted to weld long straight seams.

Stainless to Carbon Steel

A cast discharge nozzle of type 410 stainless was joined to a forged E-1020 carbon-steel barrel (Fig. 3). This pump is for a hot-oil refinery application, and superior erosion properties are desired for the suction and discharge nozzles. Because the mass of type 410 stainless was small compared to the mass of the carbon-steel barrel, a spider-type gas burner was inserted into the bore of the barrel to maintain the required preheat. Welding specifications required the 410 stainless to be preheated uniformly to 500-700 F and permitted no welding below 400 F. Temperatures were checked with temperature-indicating crayons. The completed weldment was sent to the stress-relieving furnace before any further operations were scheduled.

This weld, like all welds in 410 stainless, was made with lime-coated electrodes using d-c reverse polarity. The work was positioned for downhand welding.

A typical welder boiler feed pump nozzle is shown in Fig. 4. A forged flange, a welding elbow, and a spacer ring have all been joined together by manual arc welding with E-6010 electrodes. The mounting feet (one of which is shown) are of cast low-carbon steel.

Figure 5 shows a completely assembled boiler feed pump. You will notice that fabricated base plates are also used for these high-speed, high-pressure pumps. Formerly, the base plates were of cast iron, but welded fabrication has saved time and material and cut down the overall weight.

Boiler feed pumps are of many different sizes and designed for many different conditions. Another example is not much more than a yard long and was designed for an operating pressure of 2,500 psi and a maximum temperature of 620 F. A hydrostatic test at 4,500 psi was made. The materials are forged and rolled type 410 stainless, and all of the manual, multiple-pass welds were made with lime-coated 410 electrodes. Our standard preheating and stress-relieving procedure was followed.

A part that cannot be completely cast may be "cast-weld"; *i.e.*, cast in several sections that are welded together. An interesting application of cast-weld construction is the low-carbon, cast-steel crossover cover for a pipeline pump pictured in Fig. 7. The size and design precluded procurement of a homogeneous one-piece casting so this crossover cover was cast in four sections. The welding bevel was incorporated in the pattern for each section to avoid joint preparation. The material was a medium-carbon steel ASTM A-216 Grade WCB, with a maximum of 0.35% carbon. All welds were manual multiple-pass welds, made without preheating. A low-hydrogen, mineral-coated E-7015 electrode was used. After the welding had been completed, the cast-weld cover was furnace stress relieved at 1,250 F.

Incidentally, this pump and others like it are used on the Trans-Arabian pipeline. For those interested in statistics, these pumps are directly connected to a 6,000-hp steam turbine, operating at a speed of 3,600 rpm. The pump will deliver 400,000 barrels of oil per 24 hours at a discharge pressure of 800 psi.

Unconventional Pump Types

The "stuffing-boxless" pump embodies the use of cast, forged, and rolled components (Fig. 6) made of low-carbon steel, type 302 stainless steel and Inconel. The welds were made by either manual metal-arc or inert-arc processes, and all pressure and seal welds were subject to 100% radiographic inspection.

The cylinder at the extreme right of Fig. 6 was fabricated from Inconel 0.020 in. thick; it required one longitudinal and three circumferential welds—one at the top, one at the step section and the third to join the cylinder to a casting of 302 stainless. All of these welds were made by the inert-arc method, using a filler rod of the same composition as the base metal. The rotor, at the bottom center, is a copper bar covered with a rolled jacket of 0.018-in. Inconel. After the jacket had been rolled around the rotor, the longitudinal seam was inert-arc welded, and the ends of the rotor jacket were welded to the rotor end rings by the same process.

The motor case on the extreme left was forged from type 302 stainless. The case was covered with a water jacket of low-carbon steel, welds in which were made with lime-coated 309 electrodes, using conventional manual technique.

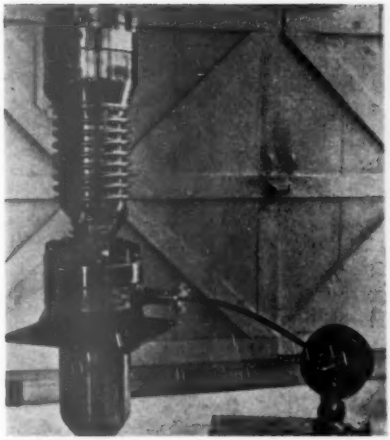
Helium Leak Tests

After assembly of the various components, the finished pump was hydro-tested and subjected to helium leak tests. Our leak test equipment is a simplified mass spectrometer that is sensitive to minute traces of helium. It is calibrated to indicate any leakage in excess of 0.00005 cc of helium per second.

Another interesting pump utilizes forged and wrought type 347 stainless, Inconel and the new precipitation-hardening stainless steel. This pump was designed for a 5,000-psi discharge pressure and a maximum temperature of 800 F. It was hydrotested at 7,500 psi.

The upper half of this pump (Fig. 8) was machined from a solid 347 stainless forging. Around the forging there was a helical coil of type 347 stainless tubing, which was tack welded after coiling to retain the exact placement of each coil.

At the bottom was another forging machined from solid 347 stainless steel. To this, the base plate and suction discharge nozzle were welded, and the component was solution annealed and passivated.



8–TOP and bottom were machined from 347 stainless forgings. Coil is stainless tubing

9–SUCTION elbow suggests mammoth size of Grand Coulee dam pumps. The 14-ft-diameter elbow was fabricated of ¾-in. plate

When preliminary tests had proved satisfactory, the helical coil on the top case was covered with a rolled jacket of type 347 stainless plate and completely seal welded. The balancing chamber was welded on, and the unit was ready for final testing.

On all pressure welds of this pump, we used a single-U or single-J groove joint with back-up; the other welds were plain butt joints. The welding rod was a lime-coated type 347 electrode that showed approximately 5% ferrite in the microstructure. All welds were manual. The multiple-pass welding procedure required complete slag removal, which we obtained by light peening and mechanical wire brushing between passes.

Sufficient penetration was secured by our design to give welds of 100% penetration, as proved by radiographic inspection. Very satisfying results have been obtained with the lime-coated 347 electrode, and I might add that we have not found it necessary to do any repair welding because of fissures, cracks, porosity or slag entrapment since we started using this electrode and our present welding procedure.

Pumps for Grand Coulee

Probably the most massive centrifugal pumps of welded fabrication ever built are the six pumps for the Grand Coulee dam built by Pelton Water Wheel Co. (See The Welding Engineer, May, 1950, page 22). These pumps were the result of design-hydraulics by Byron Jackson Co. and mechanics and construction by Pelton. For this design, welding was considered the only practical method of fabrication.

To give you an idea of size, each completed pump weighs over 300,000 pounds. The impeller is a steel casting, which was made in a single pour and required 100,000 lb of steel. This casting, the only component not of welded construction, is 14 ft in diameter and is mounted on a 27-in. shaft. The suction pipe is 14 ft in diameter, and the discharge pipe is 12 ft in diameter. Each pump was designed to handle 700,000 gallons of water per minute or over a billion gallons of water per day.

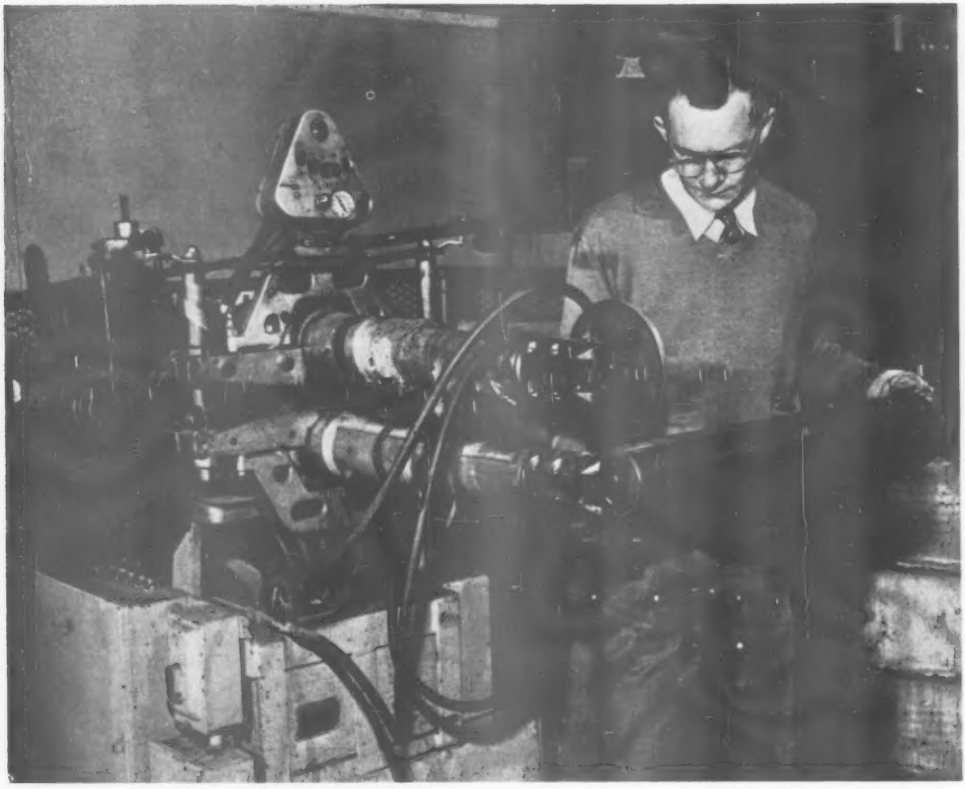
Construction of the volute halves began with two quarter sections that were joined by welding to form one-half of the diffuser ring. The material for the diffuser ring quarter sections and impeller castings was specified to conform to ASTM A-215 Grade A3, with a maximum carbon content of 0.30%. The casting sections of the diffuser ring range in thickness from 2 to 4 in. The weld joining the two quarter sections of the diffuser ring was made manually and required approximately 24 hours of continuous welding time. A local preheat was given by torch prior to the beginning of the weld.

The rolled plate, in the form of truncated cones, was fitted to the diffuser ring and tack welded. After all plate had been fitted and tack welded, the dimensions were checked and double checked before finish welding. All welds were positioned for downhand welding wherever possible, and plate edges were prepared by flame-cutting.

In the beginning, a cellulose-coated E-6010 rod was used, but welding difficulties dictated a change to a low-hydrogen E-7016 electrode. This gave very satisfactory results. Construction of these pumps was in accordance with paragraph U-68 of the ASME unfired pressure vessel code, which requires 100% radiographic inspection of all welds, 100% joint penetration and furnace stress-relieving of each completed component. All welding was performed by weldors certified to the ASME code.

The size of these units may be realized from Fig. 9, a view of a suction elbow. This component is 14 ft in diameter at the suction pipe joint and is fabricated of ¾-inch plate of A-285 Grade B, firebox quality. The reinforcing ribs, which conform to the same specification, are rolled from tees or angle shapes, fitted to the diameter of the suction elbow and then joined to the plate by intermittent fillet welds. The picture (Fig. 9) shows how the suction elbow was made in sections and joined to make the complete unit.

Part II, to be published in our next issue, will discuss problems involved in the welding of the high-hardenability heat-treatable steels that are used in the manufacture of oil-well tools.



From This . . . . . .

Above is the "Burns-Northrop" spot or seam welder, designed and built by Northrop Aircraft engineers in the early 1930's. It was used in the initial attempt to spot weld wing assemblies for a prewar airplane—the Northrop "Gamma," shown at the left. Though experimental spot-welded wings showed considerable structural integrity, riveted wings were used on the production planes

Spot and Seam Welding

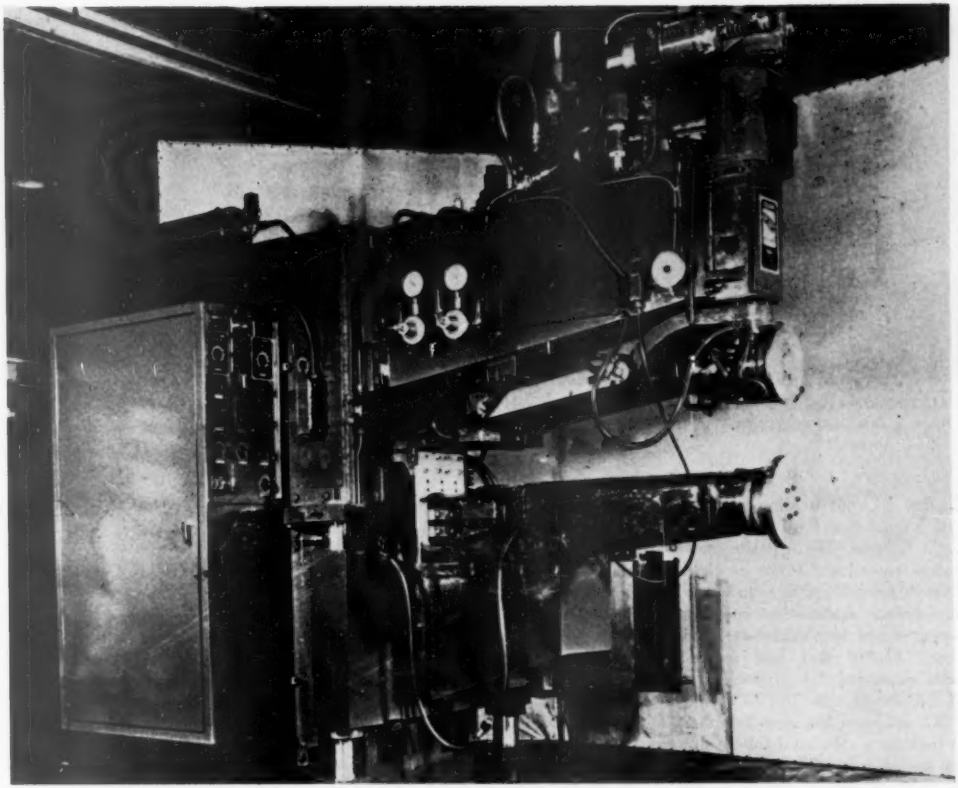
By THOMAS A. DICKINSON

WHEN the Northrop Aircraft plant at Hawthorne, Calif., initially made use of resistance-welding methods during the early 1930's, so little commercial equipment was available that the company found it expedient to design and construct its own. You can see at the top of this page what was known as the "Burns-Northrop" seam or spot welder. This, incidentally, was used in production work at Hawthorne until 1948. It was a single-phase, rocker-arm welder with gear-driven wheels (believed to be the first internally cooled seam-weld wheels).

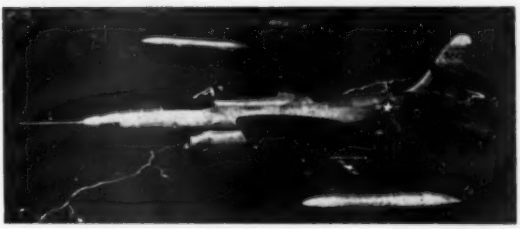
Both aluminum and stainless steel alloys (maximum 0.040 to 0.040 in.) were welded with forces of 800 lb on the electrodes. It was all right, but—

FROM THEN TO NOW

Compared with resistance machines now in operation, the Burns-Northrop welder was a rather crude device. For contrast, the picture at top of page 41 shows one of the largest combination spot-seam welders ever constructed—



. . . . . To This



Seam welder shown at top of page is one of the largest ever constructed for the aircraft industry. Standing 16 ft high, it is 18 ft long, has a throat depth of 60 in. and is capable of welding a ⅛ to a ⅛ in. sheet of 24ST or 75ST aluminum. Such equipment is needed in making aircraft like the 600-mph "Scorpion" pictured at right, an all-weather twin-jet interceptor

at Northrop Aircraft

it stands 16 ft high, is 18 ft long and has a throat depth of 60 in. This machine is capable of welding 24ST or 75ST aluminum stock with maximum thickness of ⅛ to ⅛ in.

Early structural parts that were spot welded on the Burns-Northrop comprised the stringers and skins for the wings of an experimental version of the Northrop Gamma. Tests made prior to World War II on the spot-welded Gamma wing indicated remarkable structural integrity, but weld cracks and other deficiencies such as inadequate penetration (due principally to a lack of experience in the use of resistance-welding equipment) made it necessary to assemble production versions of the Gamma wing with rivets.

Northrop continued to use resistance welders for the production of non-structural assemblies, simultaneously perfecting the quality-control techniques that are essential to the spot welding of aircraft structural parts. In 1942, the company was able to convince Air Force officials that it might be worthwhile to ascertain the practicability of accelerating pro-

ACCESS doors to Scorpion power packet are streamlined assemblies with 1,000 to 2,000 spot welds each

NORTHROP'S recently acquired three-phase welder is being used to weld an engine access door for an F-89

duction by spot welding and testing tail booms for P-61 Black Widow night fighters. The experimental tail booms turned out to be as rigid as riveted assemblies, and in resultant production work the spot-welded booms saved approximately $700 of every $1,200 that had previously been expended for riveting a pair of tail components.

No evidence has ever been found to indicate a structural failure due to the use of spot-welded tail booms!

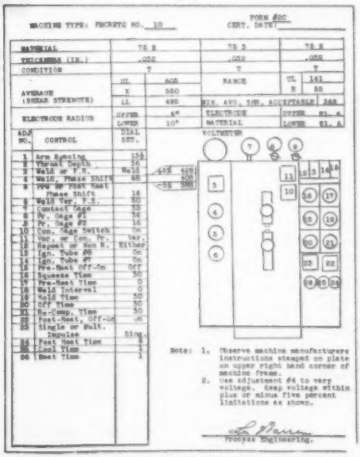
Regulations Handicap

Since the end of World War II, Northrop has been handicapped by the CAA regulations for spot welding assemblies in commercial airplanes, but considerable progress has been made in the resistance welding of structural parts for military airplanes and also for guided missiles.

Spot welding is said to be at least partly responsible for the ability of the C-125 Raider (first made by Northrop in 1946) to take off within 700 feet carrying a load of more than five tons. The Raider's spot-welded wings not only weigh less than comparable riveted structures but lack the rivet-head "spoilers" that disrupt air flow around the wings of commercial planes.

Prior to spot welding C-125 wings, Northrop engineers made tests with panels representing sections of the wing stringer-skin assemblies. The skin range was from 0.016 to 0.016 in. 24ST to 0.040 to 0.040 in. 24ST aluminum, while the stringers comprised 24ST "hat" and "Z" sections. These tests proved it was possible to resistance weld thin aluminum sheets to heavy stringers without warping, canning or buckling. The trick was to use reverse or concave contours on the outer surfaces, thus introducing residual stresses into the assemblies when the latter were flattened and bent so as to neutralize weld shrinkage stresses.

Spot-welded assemblies are more numerous than ever in F-89 Scorpion all-weather interceptors, now being produced for the Air Force. At this writing, such assemblies now include the keel or backbone of the plane, portions of the nose skins and retractable landing gear panels (which comprise parts of the wing structures in flight).



MACHINE TYPE: PROJECT NO. 10 — FORM #SC — CERT. DATE

MATERIAL	75 S		75 S		75 S
THICKNESS (IN.)	.032		.032		.032
CONDITION	T		T		T
AVERAGE (SHEAR STRENGTH)	UC	808	RANGE	UC	141
	T	550		T	88
	LC	490	MIN. AVG. SHR. ACCEPTABLE		368
ELECTRODE RADIUS	UPPER	4"	ELECTRODE	UPPER	Rl. A
	LOWER	10"	MATERIAL	LOWER	Rl. A

ADJ. NO.	CONTROL	TOTAL SET.	VOLTMETER
1	Arc Equaling	134	
2	Throat Depth	10	
3	Weld or T.S.	Weld	605 625
4	Weld, Phase Shift	66	600
	Time or Post-Heat		-15 590
	Phase Shift	16	
5	Weld Cur. F.S.	50	
6	Contact Comp.	50	
7	Pr. Comp #1	34	
8	Pr. Comp #2	16	
9	Con. Comp Switch	0	
10	Cur. Comp. Tr.	Var.	
11	Equal or Non R.	Either	
12	Ign. Tube #1	0	
13	Ign. Tube #2	50	
14	Pre-Heat Off-On	Off	
15	Squeeze Time	50	
16	Pre-Heat Time	0	
17	Weld Interval	50	
18	Weld Time	8	
19	Off Time	50	
20	Re-Comp. Time	0	
21	Post-Heat, Off-On	On	
22	Single or Mult. Impulse	Sing.	
23	Post Heat Time	1	
24	Cool Time	1	
25	Heat Time	1	

Note: 1. Observe machine manufacturers instructions stamped on plate on upper right hand corner of machine frame.
2. Use adjustment #4 to vary voltage. Keep voltage within plus or minus five percent limitations as shown.

PROCESS ENGINEERING

QUALITY control chart is used to establish the consistency of welds made on the three-phase spot welder

Three-Phase Welding

Access doors for the fuselage power packet of the F-89 are of particular interest. These have to be very rigid yet perfectly smooth if they are to serve their purposes as airfoils. Their airfoil dimensions range from 3 by 6 ft to 7 by 4½ ft in area, and 1,000 and 2,000 individual spot welds respectively are required to make the smallest and largest doors.

Northrop's recently acquired three-phase spot welder is used to weld the engine access doors of the F-89. This is another large machine, capable of welding 0.051 in. to 0.051 in. and 0.186 to 0.186 sheets 24ST or 75ST aluminum alloys.

Quality-control charts are used by Northrop in the operation of the above three-phase machine. One of these is reproduced herewith. Similar charts are used in operating all Northrop welders, and their primary purpose is to indicate machine settings established by the process engineering department. Each setting is the result of data obtained in making 35 test welds, five of which were selected at random and microsectioned. The test values are considered satisfactory only if they conform with MIL specifications.

At the start of each production run and every thirty minutes thereafter, three weld specimens are made by each machine for individual shear

(Continued on page 62)

When to Design for

Cast-Welded Construction

BY ROBERT J. FRANCK

WHEN a metal structure becomes complicated, it is often costly and difficult to produce. Sometimes a satisfactory solution may be found by utilizing the technique of cast-weld construction. Where a one-piece part, either a casting or a weldment, would be expensive to produce, two or more simpler castings may be joined together by welding. This method combines the advantages of the casting and the welding processes.

As a handy rule-of-thumb for the foundry, the castings best adapted for redesigning by this method are those that: (1) require expensive pattern equipment, (2) are heavily cored, (3) are difficult to gate and riser or (4) otherwise present foundry production problems.

It is almost always possible to break down a complicated structure into separate components of comparatively simple shape. Sometimes castings alone may be welded together; sometimes fabricated sections cut from steel plate, shapes, tubing, etc. are introduced. The limitations of the method depend solely upon the imagination of the design engineer.

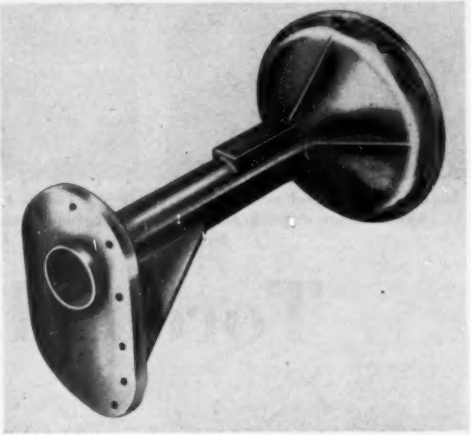
Superior Steel and Malleable Castings Co., Benton Harbor, Mich., has been able to avoid many costly one-piece castings by designing and developing the parts for cast-weld construction using either (*a*) several steel castings of simpler shape or (*b*) a combination of steel castings and rolled steel shapes or plate.

An excellent example of the cast-weld technique is provided by the drive spacer housings pictured on this page. These housings are needed in five different sizes. Each of the one-piece castings (Fig. 1) had an average weight of 52.5 lb. Five separate expensive units of pattern equipment were required. Large cores were necessary, adding to the foundry production difficulties.

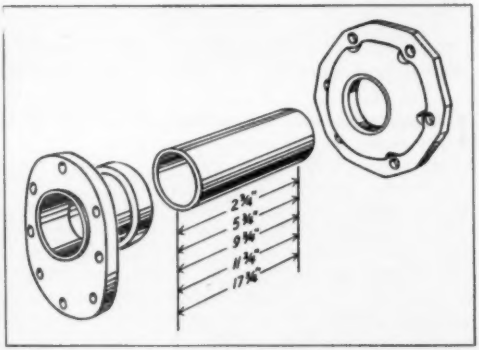
It was decided to convert to cast-weld construction as shown in Fig. 2. The part was redesigned to provide two comparatively simple steel castings for the ends. The variations in size were then taken care of by cutting lengths of tubing to the dimensions given in the drawing. The same two end castings were used for each size of housing. Each casting required only one set of pattern equipment instead of five and needed only a small core. The average weight of the completed product was reduced from 52.5 to 37.1 lb. Foundry production difficulties were eliminated.

Figure 3 shows a completed set of drive spacer housings in the five sizes produced by welding intermediate lengths of tubing to the two end castings. The spacers have proved themselves in the field, and the cast-weld construction has effected a saving of 38.4%.

Remember the rule-of-thumb. Does the casting require expensive pattern equipment? Is it heavily cored? Are gates and risers hard to introduce? Is it causing the foundry production difficulties? If the answer is yes to one or more of these four questions, then you ought to be considering cast-weld construction.



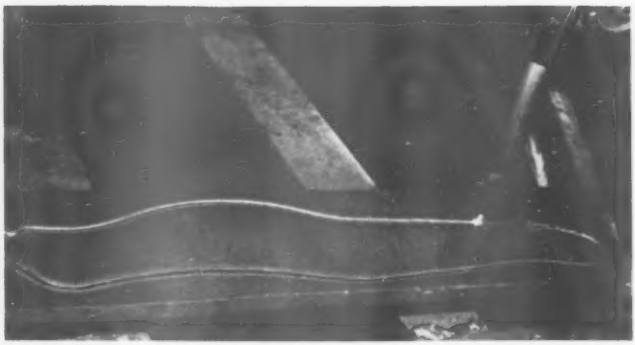
1—CASTING for drive spacer housing was needed in five sizes, requiring five sets of pattern equipment



2—HOW PART was redesigned. End castings fitting all sizes are welded to tubes cut to dimensions shown

3—INSTEAD of five hard-to-produce castings, two simple castings suffice for complete set of housings

1—HEATING Diesel wheel guard to expand it for a quick removal



2—CUTTING a Diesel brake lever from forged axle steel—an example of a production method that saves considerably in costs of replacement parts

Torch Maintenance for

Oxyacetylene processes utilized on Seaboard Railroad vary from simple heating operations to automatic shape-cutting and on up the scale to the fabrication and reclamation of parts that operate under hard service.

BY W. D. WALDRON
Welding Supervisor, Seaboard Air Line Railroad Co., Jacksonville, Fla.

THE gradual passing of steam motive power on our railroad has brought about changes in the use of oxyacetylene processes. There is a great difference between the repairs made to a cracked steam locomotive frame, for instance, and the air-acetylene heating that is used to solder the copper in a Diesel traction motor commutator. The former operation required one type of skill, and the latter demands a very different type. However, there are still many applications in Diesel maintenance that require the oxyacetylene welding torch.

The oxyacetylene flame is used by the Seaboard in practically all metal working. In the mechanical department, it is used in the fabrication and repair of parts for passenger and freight cars and steam and Diesel locomotives. On track work, worn frogs and switch points are rebuilt; rail ends, frogs and crossings are oxyacetylene flame-hardened. The rails in the Jacksonville station are oxyacetylene pressure-welded rail. We will, however, confine the discussion of the oxyacetylene processes used on this railroad to the applications at our Jacksonville shops.

Piped for Welding Gases

These shops are completely piped with acetylene and oxygen. There are approximately 275 station outlets for these gases. Acetylene is generated by two low-pressure generators with a rated capacity of 1,000 cu ft per hour. Oxygen is delivered through pipelines at a pressure of 60 psi from a liquid-oxygen storage unit with a capacity of 90,000 cu ft. Incidentally, the thousands of feet of piping that carry oxygen, acetylene and compressed air to all points within the shop are oxyacetylene welded. This pipe varies in size from ½ to 4½ in.

Where cars undergo heavy repairs, many station outlets are erected above floor level. This is a good arrangement to use between the car lines when no columns are available. In this shop there are 145 stations, and in a heavy period of work 90 torches will be used. Some of these will be cutting torches, used to remove rivets or cut out defective metal. Other welding torches in this building are used as a quick source of heat for bending and straightening.

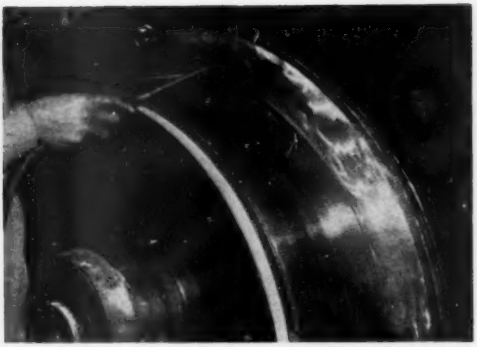
Close to the car repair shop is a building housing an automatic shape-cutting machine, which prepares plate shapes for car repair work and is also used for cutting slack washers and follower blocks.

The railroad has many gondolas for handling phosphate rock, drop doors of which corrode badly. The replacements are taken care of by fabricating doors in our shops. Die-stamped plates are welded on the four corners. Prior to forming, each corner is manually flame-cut so that the corners are neat and smooth when welded. The heat of the welding torch is used to heat a small section that the weldor can hammer to a smooth curve prior to welding.

Gouging before Welding

Flame-gouging is used to remove steel in the damaged area of a freight car truck side when making a welded repair. Prior to welding, the truck sideframe is preheated to 600 F. With the gouging tip, the operator gets down to the bottom of the crack. Then the flame-gouged area is oxyacetylene welded, using high-strength alloy rod. Worn bolster wearing surfaces are built up by using a steel rod. Following all repairs, the frames are heated to 1,550 F and air cooled.

3—SOLDERING a lug to a traction motor coil lead, a job that will be done with an air-acetylene torch

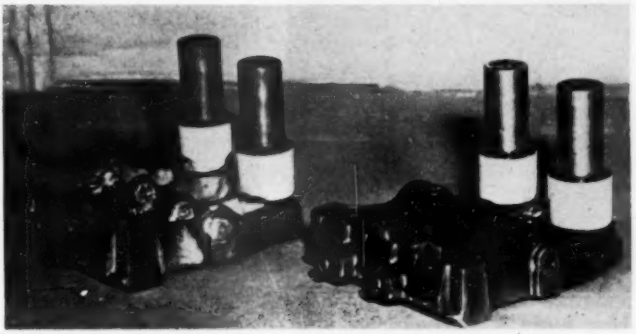


4—AIR-ACETYLENE flame is also used to solder commutator risers and to remove coil ends from risers

Diesels*

This shop also builds up coupler parts by oxyacetylene welding, using high-strength steel rod. Before welding, the parts are heated to 1,200 F. This speeds the welding and eliminates the need for postnormalizing. The smooth deposit laid down by skilled operators eliminates any need for postweld grinding.

Brake heads, which hold brake shoes, are subject to heavy wear and are reclaimed in large volume. Diesel brake heads are of steel and are built up with high-strength steel rod. Freight brake heads are of malleable iron and are built-up with cast-iron rod to increase their wearing quality. Following the building-up of worn surfaces, the heads are normalized at 1,000 F. No machining of deposited metal is needed.

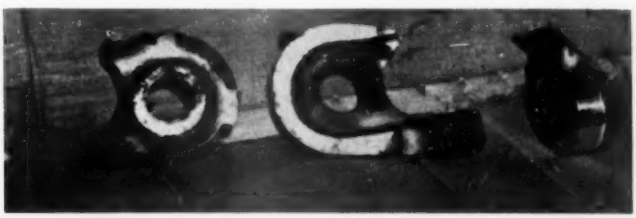


5—WELDING up holes of Diesel brush holders helps to eliminate out-of-round conditions. On left, holes as-welded; on right, holes redrilled

Diesel Locomotive Parts

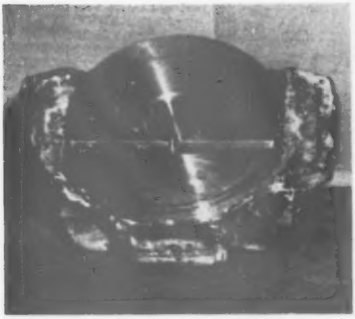
The pictures accompanying this article show the fabrication or reclamation of Diesel locomotive parts by oxyacetylene or air-acetylene processes. Let us first consider heating applications. In Fig. 1, the heat of the oxyacetylene flame is being used to expand a Diesel wheel dust guard so that it can be removed. The 150 tip (drill size 17, orifice 0.173 in.) produces enough heat so that a guard can be removed in one minute. The

6—REBUILDING worn areas up to surface with steel filler rod. These Diesel truck equalizers are subject to heavy wear on the foot and corners

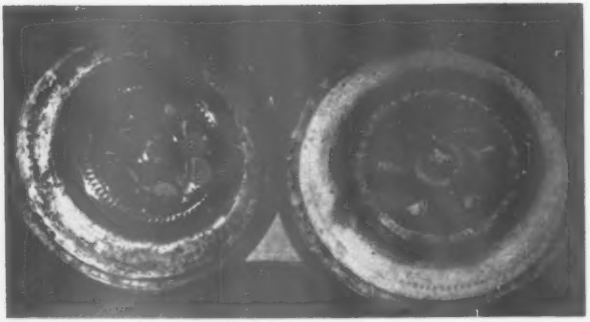


7—CAST-STEEL parts rebuilt with bronze rod. Left and center brake friction arms are for freight, arm at right for passenger locomotives

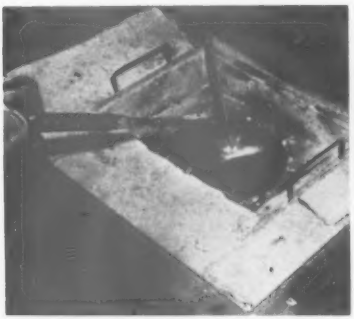
*Abstract of paper presented at the 1952 annual meeting, International Acetylene Association, Indianapolis, March 31, 1952.



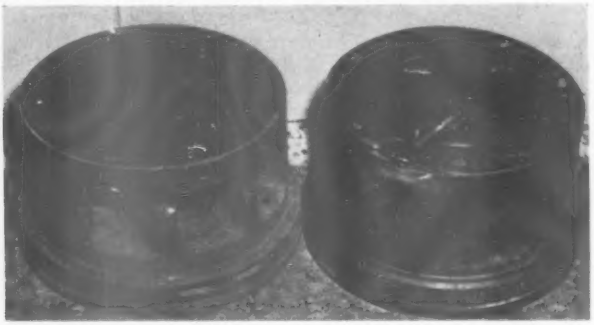
8—BRONZE on thrust-end bearing was melted out and replaced with new metal



9—COMPRESSOR clutch sheaves restored by bronze deposits. Wheel at right is in as-welded condition; wheel on left has been machined



10—CYLINDER head is welded while being heated in a charcoal-fired oven



11—WELDED cylinder heads. The head at the left is as-welded and the head at right is the same type after first machining operations

same flame is used to expand dust guards so that they can be fitted on the axles. Six or eight guards are stacked up, and the flame is played down two sides of the pile. The dust guards are then quickly placed on the axles, one at a time.

An expanding application is the flame-cutting of parts for Diesel brake rigging. In Fig. 2, a Diesel brake lever is being flame-cut at 16 ipm from forged axle steel 1¼ in. thick, using a cutting tip with an orifice of drill size 53 (0.0595 in.). This method of production means major savings in Diesel replacement expenses.

Application of the air-acetylene flame is shown in Fig. 3. The job is to solder a lug to a traction motor coil lead, using a 50% tin and 50% lead solder with an air-acetylene torch.

In Fig. 4, the air-acetylene flame is used to solder main generator commutator risers. The solder is 95% tin and 5% antimony. Another application of the air-acetylene flame is to remove coil ends from risers preparatory to rewinding armatures.

Figure 5 illustrates an application on Diesel brush holders. On these bronze parts, the holes for the tension spring support shaft wear out of round. To eliminate this condition, we weld up the holes solidly and redrill. The part at the left is in the as-welded condition and that at the right has been redrilled ready for use. Pitting is frequently encountered but is taken care of by filling in with 95-5 solder, using an air-acetylene flame.

Building up Worn Surfaces

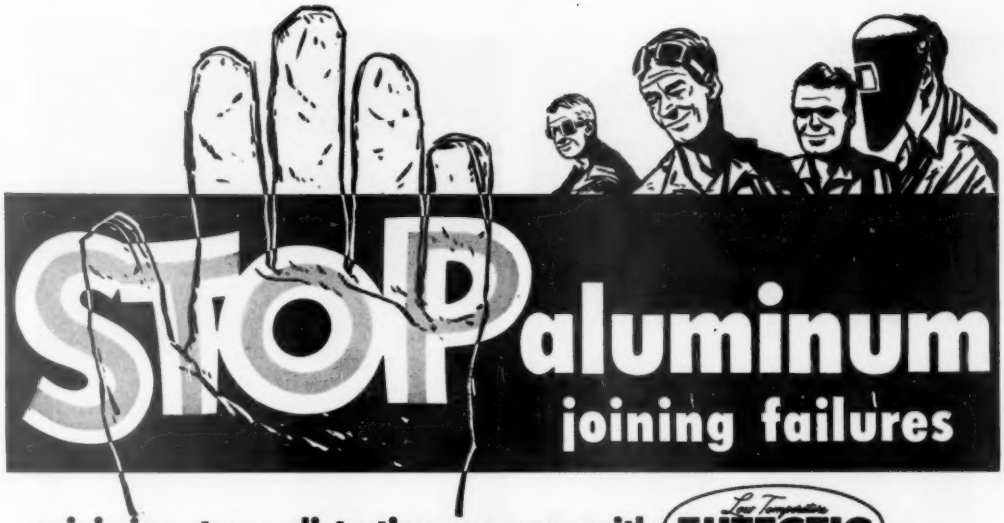
Diesel truck equalizers of forged steel are subject to heavy wear on the foot and corners. Using a large tip, these worn areas are built up to surface with a deposit of steel rod varying from 1/16 to ½ in. thick. The torch and a flatter are all that are needed to produce a smooth, ready-to-use finish (Fig. 6).

The locomotive brake friction arms in Fig. 7, though of cast steel, were rebuilt with bronze rod. The parts at center and at left are opposite sides of the friction arms used in freight locomotives; the part at right is for passenger locomotives. In the latter, a ⅛-in. layer of bronze was deposited, and the part was machined to size. The freight locomotive parts were built up in two areas with about 1/16 in. of bronze and required no finishing.

Figure 8 shows a Diesel locomotive thrust-end bearing in the process of being reclaimed. The original cast bronze was melted out with the oxy-acetylene flame, and a deposit ½ in. deep was made. The part was then machined, making it equal to new.

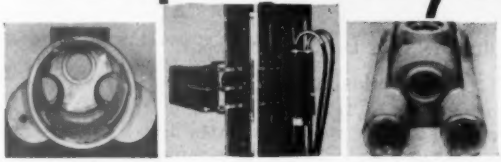
Traction motor suspension bearings for freight locomotives are reclaimed when they wear down on the hub face. These bearings are built up about ¼ in. with bronze and then machined to dimension. The bearings used on passenger locomotives are lined with a bearing metal. To pre-

(Continued on page 66)



STOP aluminum joining failures

minimize stress, distortion, warpage with Lee Temple's EUTECTIC WELDING ALLOYS



Previously Considered "Impossible", 11-Part Liquid-Proof, Shock-Proof X-Ray Assembly Now Welded for Maximum Strength, Safety

"Our X-Ray tube housing is fabricated from eleven different parts that are assembled and welded. This assembly is then immersed in water and tested to withstand 50 lbs., air pressure to insure against leaks or porous welds. After the tube is joined, the inside of the housing is lined with lead to imprison the dangerous X-Rays.

An additional factor that makes this such a difficult metal-joining problem is the extremely wide temperature range to which the housing is subjected. The tube, ordinarily remaining at room temperature when not in use, rapidly attains a heat of 215°F. in operation, making the use of solder impractical.

Test after test of welding alloys in various price ranges had failed in one or another of the requirements. One of the chief causes of failure was the high heat at which conventional welding alloys are applied. This high heat either melted the delicate threading on the fittings or required extensive aftermachining and finishing before the crinkle finish could be applied to the completed piece.

Finally EutecRod 190, the new EUTECTIC Low Temperature WELDING ALLOY, was recommended and tested — and met *all* requirements! Expensive finishing was eliminated due to the unique thin-flowing characteristics of the alloys. Because of the low heat of application, the threads remained unharmed, rejects were eliminated, and production speed increased enormously. Tensile tests definitely proved that the strength of the joint was multiplied many times over—while the actual *cost per job decreased!*

The day we first tested EutecRod 190 was an extremely profitable one for us!"

—M-Laboratories, Connecticut*

*Full name and address on request.

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Let us prove it in YOUR shop, just as we have in over 78,000 other plants and shops throughout America. There's no cost, no obligation involved. Just fill in and mail the coupon, below, for a FREE Consultation-Demonstration from one of our 350 trained District Engineers who stand ready to serve you from coast to coast. **Prove to yourself that there is something new and different in metal-joining . . .**

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TRACK-SUPPORT frame lifts an entire railroad car. Chief Fraser and assistants are standing beside car

FALLING rock from a tilted gondola car falls into hopper. Conveyor belts carry it to the rock crusher

Seabees' Welded Car Dumper

In line with their motto of "Can Do," the Seabees of MCB-2 figured out a way to end a rock-unloading bottleneck

BY W. C. HENZLIK

TODAY'S jet fighters and bombers are heavier and harder on runways, aprons and taxiways than those of World War II. Hence it was found necessary to rehabilitate and expand the U. S. Naval Air Station at Atsugi, Japan. A Seabee outfit, Mobile Construction Battalion No. 2 (MCB-2), was sent to Atsugi to do the job.

A lot of gravel was needed for the concrete and for subgrade stabilization of the soil. Within a few days after MCB-2's arrival, cars of crushed rock for the concrete aggregate were being shunted onto sidings near the airfield. A hundred Japanese laborers were rounded up to shovel the rock from the cars into trucks, but the unloading went slowly.

Knocked up Cars

Later the battalion's heavy equipment arrived at Atsugi. A ¾-yd clamshell did the work of 80 laborers, but it still left a considerable amount of rock at the sides and ends of the cars. Even worse, the steel bucket was knocking the stuffing out of the flimsy wooden Japanese cars. Then cars loaded with river-run gravel began to arrive, and the clamshell began to fall behind the unloading schedule.

The Seabees licked the problem temporarily by suspending a bulldozer blade (with welded modifications) from the ¾-yd crane. A chain harness on the blade allowed it to be dragged across the car when both sides were dropped, sweeping the gravel before it. It worked all right until MCB-2's 120-ton-per-hour rock crusher was installed. The new crusher demanded 100 cars of rock per day—too much for even the crane-dozer.

Chief Mechanic Clark L. Fraser had been playing with the idea of bypassing all external unloading machinery. Why not tip the whole car over to unload it? The Seabees decided to try it out.

Choosing a site on a rail spur, they flame-cut the rails and pried out a section equal to the length of one car. A sturdy foundation of 18-in.-thick concrete was laid to support a frame built out of welded I-beams. The missing rails were then restored by welding them to a track-support frame in alignment with the rails on either side.

Eye-fittings were welded onto I-beams embedded into the concrete foundation. These eyes mate with hinge pins on the frame. Thus the entire track-support frame, rails and all, can be tilted upward just as you would lift a trap door in the floor. When a car is on the unloading section, it is held down by special clamps to prevent it from going over with its load. The clamps are welded to the track-support frame.

Next to the unloading section, a sunken unloading hopper was constructed at ground level (see right photo above). From here, conveyor belts carry the rock away to the crusher.

Two Winches Do Tilting

The tilting for unloading is done by two winches powered by a truck engine (on left of left picture). Stanchions for three-part wire rope tackle were provided by 14-ft-long I-beams embedded vertically in the same concrete foundation. The tackle lifts the unhinged side of the track-support frame through an angle of 35 deg, dumping the entire cargo of rock in a matter of seconds.

A complete unloading cycle requires the efforts of three men for five minutes. First, the loaded car is towed onto the dumping section of track with the front winch. The track and car are then lifted by two other winches. A steady rate of 100 cars per eight-hour day is maintained.

Height, 6 ft, 5 in.
Width, 1 ft, 5 in.
Base, 1 ft, 5 in. x 3 ft
Thickness, 1½ in.
Weight, 1509 lb
Height, 9 ft, 8 in.
Width, 2 ft, 6 in.
Base, 2 ft, 6 in. x 4 ft, 8 in.
Thickness, 3 in.
Weight, 7778 lb
Height, 12 ft, 1 in.
Width, 2 ft, 6 in.
Base, 2 ft, 6 in. x 4 ft, 8 in.
Thickness, 3 in.
Weight, 17,864 lb

Moulding-Press Frames Produced by Welding

These three moulding-press frames vary in height from 6 ft, 5 in. to 12 ft, 1 in., and in weight from 1509 lb to 17,864 lb. They were made in Bethlehem's Weldment Shop, and were produced by forming and welding heavy plate steel.

Advantages of Bethlehem Weldments

Bethlehem Weldments offer these worthwhile advantages to manufacturers of machinery and machine parts:

1. ECONOMY. Bethlehem Weldments eliminate excess weight, without any sacrifice of rigidity. This saving in weight frequently means that the finished machine can be turned out at lower cost.

2. VERSATILITY. Bethlehem Weldments can be produced in a wide range of sizes, either as simple parts or intricate assemblies.

3. FLEXIBILITY. Designers of machinery can plan freely, because the steel from which these weldments are made can be bent, pressed or otherwise shaped prior to welding, without damage to the physical structure of the steel.

4. USED SINGLY OR IN COMBINATION. Although frequently used alone, Bethlehem Weldments can also be combined with forgings or castings.

Like to have a Bethlehem representative call to discuss ways in which you may be able to use weldments effectively? All you need do is contact the nearest Bethlehem office.

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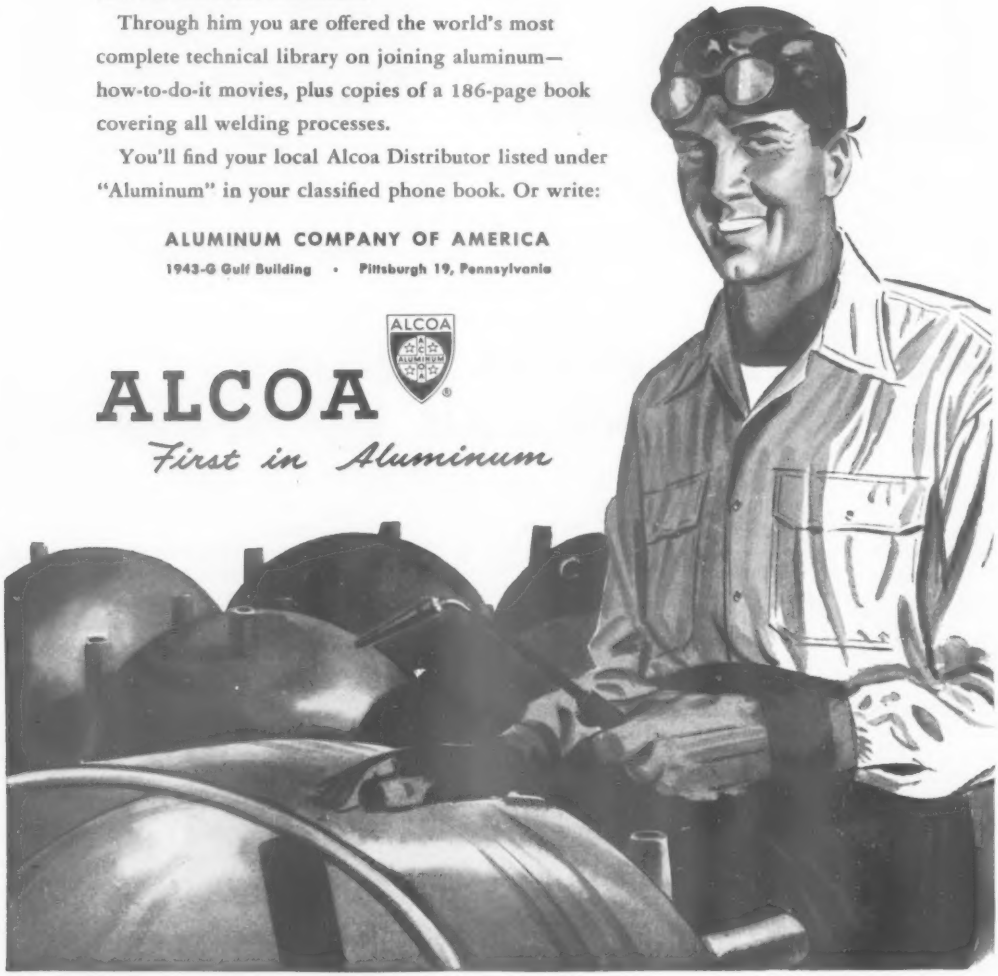

Safe Grinding Wheel Speeds

IT IS good practice to operate a grinding wheel as near to the speed recommended by the maker as possible. In general, for cylindrical grinding, wheels should be run from 5,500 to 6,500 surface feet per minute; for surface grinding from 4,000 to 6,000 s.f.p.m.; for cutter grinding from 4,500 to 6,000 s.f.p.m. and for wet tool grinding from 5,000 to 6,000 s.f.p.m. Other speeds are given in Table I.

After you have found the recommended wheel speed at the periphery, as given in Table I, the problem arises of determining the wheel diameter for a given grinder speed (revolutions per minute). The arithmetic has been performed for you in Table II. Find the proper peripheral speed above one of the columns and run down the column until you reach the nearest rpm to your grinder speed. The safe diameter of the grinding wheel can then be found in the columns at extreme left or extreme right.

Example: For snagging a weld with a resinoid wheel, recommended peripheral speed is 7,000 s.f.p.m. With a grinder speed of 4,400 rpm, the wheel diameter should be 6 in. (figures shown in rectangles).

The grain, grade and structure usually recommended for any certain operation are based on the assumption that approximately the recommended speed will be employed. If for some reason this is not possible, then the grade at least should be changed to conform to the different speed. Too slow a speed means wastage of abrasive without too much useful work in return, whereas an excessive speed may result in hard grinding action and may introduce the danger of the wheel breaking through centrifugal force* or burning the work.

Table I. Recommended Wheel Speeds in Surface Feet per Minute

Tool and cutter grinding	4,500- 6,000
Cylindrical grinding	5,500- 6,500
Internal grinding	2,000- 6,000
Snagging, offhand grinding (vitrified wheels)	5,000- 6,000
Snagging (rubber and resinoid wheels)	7,000- 9,500
Surface grinding	4,000- 6,000
Knife grinding	3,500- 4,500
Hemming cylinders	2,100- 5,500†
Wet tool grinding	5,000- 6,000
Cutting wheels	4,000- 5,000
Cutting-off wheels (rubber, resinoid and shellac)	9,000-16,000†

†This higher speed is recommended only where bearings, protection devices and machine rigidity are adequate.

*"Centrifugal force" is the force that tends to rupture a given wheel when overspeeding. It increases as the square of the velocity of the wheel. For example, the centrifugal force in a wheel running at 5,500 s.f.p.m. is 49% greater than in the same wheel running 4,500 s.f.p.m., although the speed is actually only 22% greater.

Table II. Peripheral Speed Converted to Revolutions per Minute and Wheel Diameter

Dia. of Wheel in Inches	Peripheral Speed in Feet per Minute														Dia. of Wheel in Inches
	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,500	8,000	8,500	9,000	9,500	10,000	12,000	14,000	16,000	
	Revolutions per Minute				Revolutions per Minute				Revolutions per Minute				Revolutions per Minute				
1	15,279	17,189	19,098	21,008	22,918	24,828	26,737	28,647	30,558	32,467	34,377	36,287	38,196	45,836	53,474	61,116	1
2	7,639	8,594	9,549	10,504	11,459	12,414	13,368	14,328	15,278	16,238	17,188	18,143	19,098	22,918	26,737	30,558	2
3	5,093	5,729	6,366	7,003	7,639	8,276	8,913	9,549	10,186	10,822	11,459	12,115	12,732	15,278	17,826	20,372	3
4	3,820	4,297	4,775	5,252	5,729	6,207	6,685	7,162	7,640	8,116	8,595	9,072	9,549	11,459	13,368	15,278	4
5	3,056	3,438	3,820	4,202	4,584	4,966	5,348	5,730	6,112	6,494	6,876	7,258	7,640	9,168	10,696	12,224	5
6	2,546	2,865	3,183	3,501	3,820	4,138	[4,456]	4,775	5,092	5,411	5,729	6,048	6,366	7,639	8,913	10,186	6
7	2,183	2,455	2,728	3,001	3,274	3,547	3,820	4,092	4,366	4,538	4,911	5,183	5,456	6,548	7,640	8,732	7
8	1,910	2,148	2,387	2,626	2,865	3,103	3,342	3,580	3,820	4,058	4,297	4,535	4,775	5,729	6,685	7,640	8
10	1,528	1,719	1,910	2,101	2,292	2,483	2,674	2,865	3,056	3,247	3,438	3,629	3,820	4,584	5,348	6,112	10
12	1,273	1,432	1,591	1,751	1,910	2,069	2,228	2,386	2,546	2,705	2,864	3,023	3,183	3,820	4,456	5,092	12
14	1,091	1,228	1,364	1,500	1,637	1,773	1,910	2,046	2,182	2,319	2,455	2,592	2,728	3,274	3,820	4,366	14
16	955	1,074	1,194	1,313	1,432	1,552	1,672	1,791	1,910	2,029	2,149	2,268	2,387	2,865	3,342	3,820	16
18	849	955	1,061	1,167	1,273	1,379	1,485	1,591	1,698	1,803	1,910	2,016	2,122	2,546	2,970	3,396	18
20	764	859	955	1,050	1,146	1,241	1,337	1,432	1,528	1,623	1,719	1,814	1,910	2,292	2,674	3,056	20
22	694	781	868	955	1,042	1,128	1,215	1,302	1,388	1,476	1,562	1,649	1,736	2,084	2,430	2,776	22
24	637	716	796	875	955	1,034	1,115	1,194	1,274	1,353	1,433	1,512	1,591	1,910	2,228	2,546	24
26	588	661	734	808	881	955	1,028	1,101	1,176	1,248	1,322	1,395	1,468	1,762	2,056	2,352	26
28	546	614	682	750	818	887	955	1,023	1,092	1,159	1,228	1,296	1,364	1,637	1,910	2,182	28
30	509	573	637	700	764	828	891	955	1,018	1,082	1,146	1,210	1,274	1,528	1,782	2,036	30
32	477	537	597	656	716	776	836	895	954	1,014	1,074	1,134	1,194	1,432	1,672	1,910	32
34	449	505	562	618	674	730	786	843	898	955	1,011	1,067	1,124	1,348	1,572	1,796	34
36	424	477	530	583	637	690	742	795	848	902	954	1,007	1,061	1,273	1,484	1,698	36
38	402	452	503	553	603	653	704	754	804	854	904	955	1,006	1,206	1,408	1,608	38
40	382	430	478	525	573	620	669	716	764	812	860	908	956	1,146	1,338	1,528	40
42	366	409	454	500	545	591	636	682	732	775	818	863	908	1,090	1,272	1,464	42
44	347	390	434	478	521	564	608	651	694	737	780	824	868	1,042	1,216	1,388	44
46	333	375	416	458	500	541	582	624	666	708	750	791	832	1,000	1,164	1,332	46
48	318	358	398	438	478	517	558	597	636	676	716	756	796	956	1,116	1,272	48
53	288	324	360	395	432	468	503	539	576	612	648	683	720	864	1,006	1,152	53
60	255	287	319	350	387	414	446	478	510	542	574	606	638	774	892	1,020	60
72	212	239	265	291	318	345	371	398	424	451	477	504	530	637	742	849	72

To find the peripheral speed of a wheel in feet per minute (S.F.P.M.), multiply the circumference in feet by the wheel revolutions per minute.

$$\text{S.F.P.M. of wheel} = \frac{\text{Diameter in inches} \times 3.14 \times \text{R.P.M.}}{12}$$

To find the number of revolutions per minute (R.P.M.) of the wheel spindle given the peripheral speed (S.F.P.M.) and the diameter of the wheel, multiply the peripheral speed in feet per minute by 12, and divide the product by 3.14 times the diameter of wheel in inches.

$$\text{R.P.M. of wheel spindle} = \frac{\text{S.F.P.M.} \times 12}{3.14 \times \text{diameter in inches}}$$

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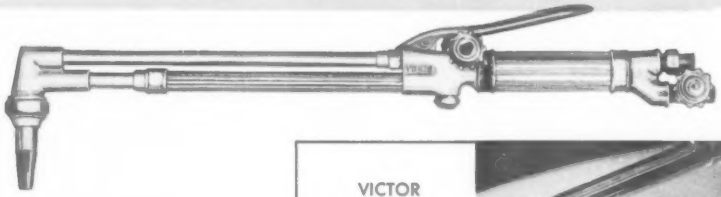

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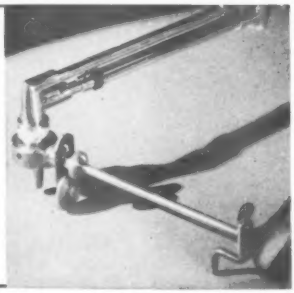

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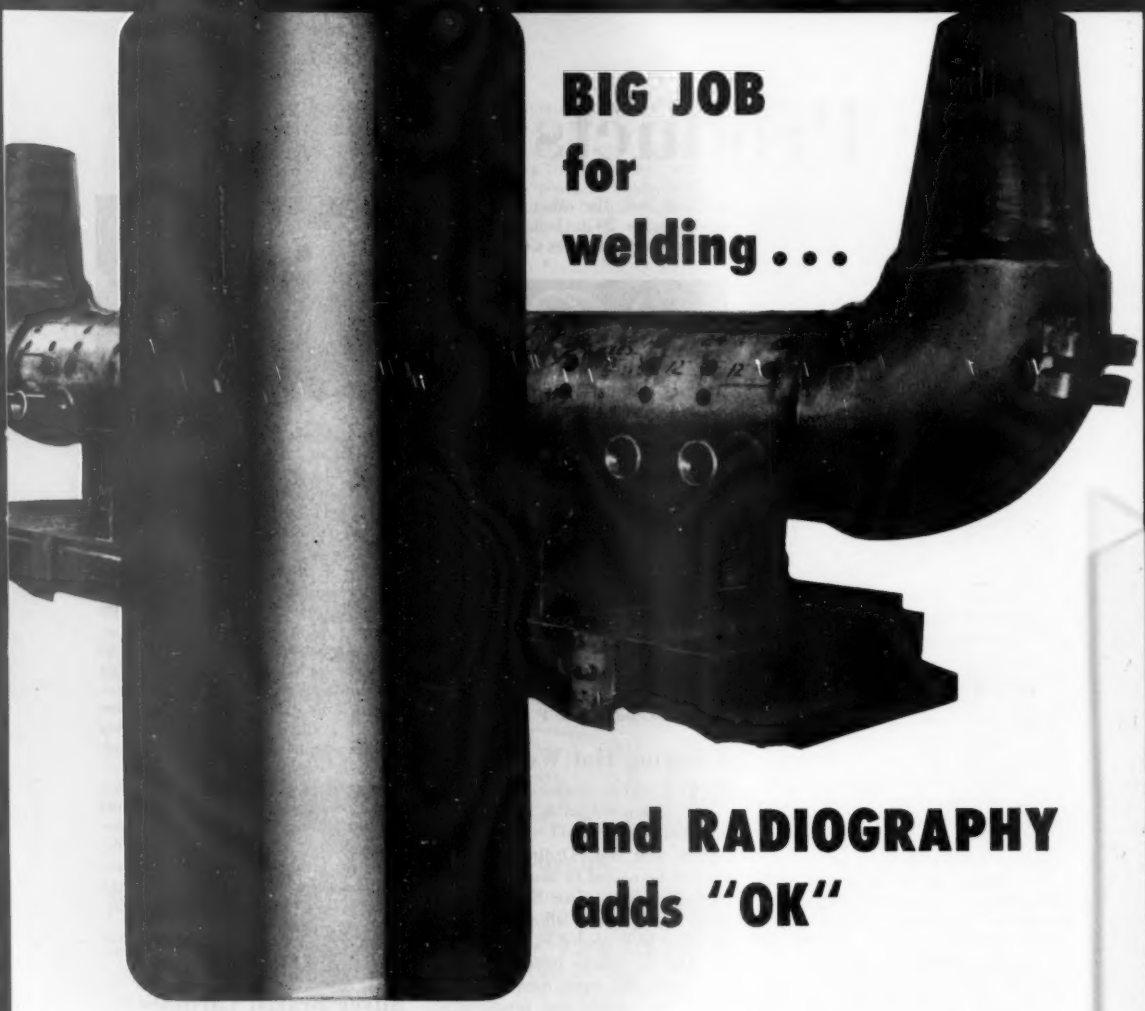

BIG JOB for welding . . .

and RADIOGRAPHY adds "OK"

Here you see the lower drum of a large stationary boiler. All seams of the shell are welded. So are the extensions and elbows. And every weld has been radiographed to prove it sound. For radiography would reveal any serious lack of fusion or gas porosities.

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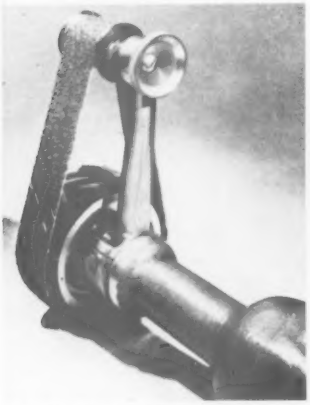


BELT ATTACHMENT converts portable grinder to new finishing role

Portable Belt Grinder

250 BRAND-new belt grinding attachments for portable air and electric grinders offer a completely new range of applications around metal-working plants. The "61" Portabelt attachment is the joint development of The Carborundum Co. and Buckeye Tool Corp.

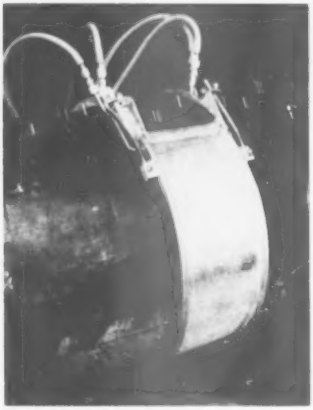
It consists of: a supporting arm about 6-in. long, an idler pulley mounted on the arm and a contact wheel for the grinder spindle. All parts are aluminum castings. The contact wheel is a small-sized version of the "61" model recently brought out for backstand belt grinding. The arm attachment is fastened to the grinder by a split bracket at the point where grinding wheel guards are normally mounted.

Although adaptable to almost any portable tool, best working conditions are obtained where spindle speeds are 15,000 rpm for a 2-in. contact wheel and 9,000 rpm for a 4-in. wheel. Speeds from 5,000 to 10,000 surface feet per minute are recommended for efficient belt usage.

The new attachment has been found very successful in weld grinding, since only excess weld metal is removed without adjacent areas being affected. On some welds, the belt attachment successfully performs in one operation what previously required the use of a cup wheel, sander disc and set-up wheel. Two models are available, one with a 2-in. wheel and a 12-in. belt, the other with a 4-in. wheel and a 20-in. belt.

THE CARBORUNDUM CO.

* * *



COOLED JIG permits X-raying of partly-welded 1,000 F pipe joints

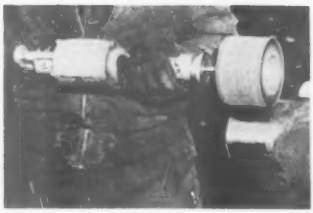
X-Raying Hot Welds

251 A NEW inspection process makes it feasible to X-ray partially-completed weld joints while they're still hot. Ordinarily, welds have to be cooled to about 100 F before it's safe to place X-ray film on them. With certain alloys, this cooling must be preceded by post-heating the weld to relieve internal stresses. Because of the many man-hours necessary for cooling and post-heating, the usual practice has been to complete a joint before inspecting it.

With the new McElroy-McNutt process, a source of radiation (such as radium) is placed on one side of the weld metal. A hollow jig is placed on the opposite side of the hot metal with a radiographic film on the outer surface of the jig. A cooling fluid passes through the jig keeping it cool enough to take pictures of the weld metal, though the latter may be as hot as 1,000 F. Tests have shown that excellent radiographs can be made this way.

Welding time on comparable sections of pipe at a large eastern power plant was reduced from 9 days to less than 3 days when the work was inspected by the new process.

SAM TOUR & CO., INC.



Air-Inflated Grinder

252 CLEANING of pipe ends in preparation for welding is said to be accomplished speedily with a new air-inflated polishing wheel. Called the "Nu-Matic Grinder," it utilizes a rubber drum 5 in. in diameter with a 3½-in. wide face. The drum is mounted on a flange with either a ½ or ⅝-in. arbor.

In operation, the worker slips an abrasive belt over the drum before he inflates it with air at 3 to 10 psi. The drum will fit any standard power tool and with different air pressures can be adapted for almost any grinding task.

Biggest advantage of the new drum is the resiliency it offers. This permits greater abrasive contact area, eliminates chatter and bounce and is 100% safe. In addition, certain users have claimed abrasive belt life is more than doubled.

NU-MATIC GRINDERS, INC.

* * *

Silver Brazed Carbides

253 HANDY & HARMAN has a new "EB" silver brazing alloy intended for brazing chromium carbide, cast carbides and other "hard-to-wet" carbides. Effective results have been obtained on high tungsten-copper alloy, cer-mets and other refractory alloys.

The "EB" alloy is composed of 57% silver, balance copper, manganese and tin. Its melting point is 1,120 F and flow point 1,345 F. No volatile elements are included in the alloy and it is not susceptible to dezincification type of corrosion. A successful use has been noted on Type 316 stainless subjected in service to dilute mineral acid corrosion. Handy & Harman says this doesn't imply a general recommendation for corrosion service, however.

HANDY & HARMAN.

For more information on these products, fill in item numbers on cards, pages 17-18

Two-Colored Lens

254 A ONE-PIECE two-colored welding lens, designed specifically for workers exposed to intense visible light, ultraviolet and infrared radiations is also hardened for impact protection. The new lens has the strength of a single lens since it is fused by a special process. There is no junction between the sections that might collect dirt or cause light interference.

Beveled to fit metal or acetate spectacle goggles and also cup-type goggles, the new bi-colored lenses come in varying shades and can be obtained in both flat and six curve in the following combinations: Cobalt-clear, Noviweld-clear, Calobar-clear, Noviweld-Calobar and Noviweld-Noviweld.

AMERICAN OPTICAL CO.

* * *

Knee Protector

255 SPONGE rubber protective pads for knees and elbows are said to be useful to weldors, industrial workers, mechanics, carpenters and other people engaged in crawling or clambering occupations. The pad is cupped to fit the knees and elbows and has an adjustable strap to fit any leg.

GEO. GILLIS SHOE CORP.

* * *

Safety File Handle

256 WOODEN handles for holding industrial files safely and strongly come in seven different sizes and models. The tangs of most mill or flat files fit into the soft-alloy steel V-blocks on the base of the handle. The blocks are dove-tail cut so that variations in the file tangs can be taken care of.

Files are mounted by placing the handle (including V-blocks) into a vise. The file is then driven into the V-block with a wooden or similar cushioning material placed between the file end and the hammer.

Filing is much easier with such handles, says the company, with no interference problem since both V-block and handle base are above the filing surface. Moisture and oil are absorbed by the handle to help firm gripping.

REMONT MFG. CO.

* * *

Small Toggle Clamp

257 A light, compact, portable toggle clamp, De-STA-Co No. 424 is particularly suitable for holding sheet metal parts during welding operations.

THE DETROIT STAMPING CO.

* * *

Safety Goggles

258 A transparent plastic frame on a new safety goggle offers a greater field of vision. It can be worn directly over the eyes or over spectacles. Uses are seen in the spot welding, light chipping and grinding and light riveting fields.

AMERICAN OPTICAL CO.

* * *

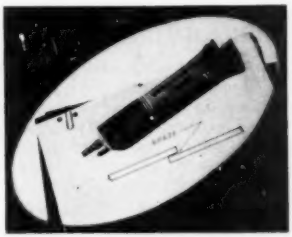
Silver Brazing Flux

259 A SPECIAL compounding process used in "G-B No. 99" silver brazing flux is said to make it unusually active in cleaning through a temperature range of 800 to 1,350 F. It's recommended for use with silver solder and having a melting range of 1,145 to 1,300 F. Having a fast action, it is useful for torch applications where heating cycles are short.

"G-B No. 99" is completely dehydrated and packaged as a dry powder. Batches of any size desired are mixed by adding water. It comes in 2 oz, 8 oz, 12 oz, 1 lb and 5 lb jars.

GOLDSMITH BROS. SMELTING & REFINING CO.

* * *



Copper Brazing Paste

260 "PHOS-COPPER," the Westinghouse free-flowing brazing alloy now comes in a tube like toothpaste. It consists of finely powdered "Phos-Copper" suspended in a petroleum jelly. A small amount of the paste is placed between two workpieces which are then raised to brazing temperature. The petroleum jelly vaporizes leaving a strong, ductile bond of copper alloy. On most applications, no flux is required.

It is especially useful for resistance brazing since it can be easily placed between thin sheets of metal. The paste comes in 1-lb tubes and 5 and 30 lb cans.

WESTINGHOUSE ELECTRIC CORP.

* * *

Engine Governor

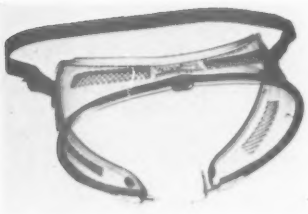
261 EXCEPTIONALLY long range of speed settings is claimed for a new governor for engine-driven welders. It provides variable speed settings and correct engine controls at any point between 1,200 and 2,600 rpm. Higher speeds are obtainable by a simple pulley adjustment.

The new governor operates equally well at variable and at constant speeds. For variable speed operation, a quadrant or similar manual control is used. For constant speed, the lever is locked.

The "Long Range Unversal" is easily installed on either side of the engine. Speed control lever, carburetor control and the mounting flange fit on either side of the governor.

THE PIERCE GOVERNOR CO., INC.

For more information on these products, fill in item numbers on cards, pages 17-18

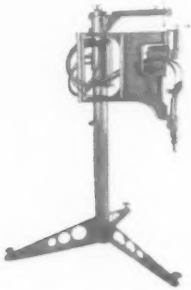


All-Plastic Goggle

262 A FLEXIBLE, fully transparent frame of vinyl plastic is featured on a Willson safety goggle. Known as the No. 91, it weighs just over an ounce. The lens retaining design has been improved as have the frame fitting features. The lens is made of 0.060 in. acetate and is separately replaceable for economy. The goggle fits over all types of prescription glasses.

WILLSON PRODUCTS, INC.

* * *



Torch Guiding Machine

263 A NEW oxyacetylene flame-cutting machine offers economy and flexibility to large and small warehouses and fabricators. Called the "Ultra-Graph," it controls speed and path of torch travel automatically.

A strong permanent magnetic field provides positive attraction of power-driven friction rotor to the edge of a steel pattern. Speed controls vary for materials from 1/16 in. to 8 in. thick. Complex shapes can be cut, including a 63-in. straight line, a 32-in. circle and 76-in. diameter half-circle. It is also said to handle detail work with tolerances as low as plus or minus 1/64.

HEATH ENGINEERING CO.

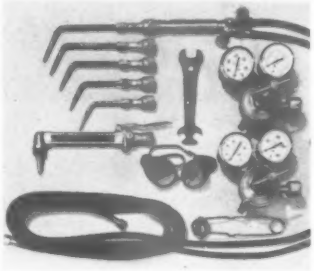
* * *

Surface Pyrometer

264 A SELECTION of 14 different types of thermocouples and extension arms to meet every surface and sub-surface temperature-measuring problem is available with the new "Pyro" surface pyrometer. Thermocouples are interchangeable without adjustment or recalibration. Temperature readings can be taken readily from the 4¾-in. direct-reading dial, which is housed in a shock-, dust- and moisture-resistant steel case. Instrument comes in five different temperature ranges.

PYROMETER INSTRUMENT CO.

* * *



Gas Welding Kit

265 A NEW model G-K series of welding and cutting equipment, for normal repair, maintenance and light industrial work, has been added to the Marquette line. It features quality products in the medium price range.

Features of the new torches include new O-ring seals, claimed to be superior for metal-to-metal connections, to permit 360-deg tip alignment, to eliminate soldering connections and to be positive and gas-tight.

The torches have cool operating tips with heavy-wall tubing. Handles are easy to hold and balance. Special alloy brass used in the head assures high strength. Threads and seats are protected by the large knurled brass swivel nut. The Model G welding torch and tips and Model K assembly are available in complete outfits or as individual items.

MARQUETTE MFG. CO., INC.

* * *

Ansco X-Ray Films

266 COMPLETE line of industrial X-ray films is now offered by Ansco for low or high kv exposures as well as radium or cobalt gamma radiation.

The company's "Superay A" has an improved and tougher overcoating to withstand industrial use. It can be used between lead screens with high voltages on heavy sections, without screens for low-voltage inspection of aluminum or magnesium or with gamma radiation for checking pipe welds or castings.

Finest grain and highest contrast film of the group is "Superay B" for optimum radiographic definition when speed isn't important. It's useful on both high and low voltage inspection of objects having varying thicknesses.

Ansco "Superay C" is a new non-screen film providing maximum speed with the best practical balance in contrast and grain size. It should find wide use where high-speed checking of weldments, forgings and castings is necessary.

"High Speed" film is recommended for industrial uses where exposures are made with calcium tungstate screens or where X-ray equipment of limited output is employed to inspect very heavy sections. It's also good for mass radiography of castings.

ANSCO, DIV. OF GENERAL ANILINE & FILM CORP.

* * *

Welding Cup-Goggles

267 IMPROVED model weldor's cup-type goggles are claimed to fit without undue pressure and to have baffled ventilation ports assuring free air circulation. Known as style No. 502, the goggles are recommended for oxyacetylene welding, cutting, burning, scarfing, brazing and furnace operations.

Cups are molded to conform to right and left eye areas of the face, with smooth wide-bearing facial contact surfaces. Moisture and sweat won't affect the cup material. For easy lens changing, the cups have screw-type lens rings.

FENDALL CO.

* * *

Phos-Silver Alloy

268 Extreme fluidity and good wetting are claimed for "Phos-Silver," a new copper-phosphorous-silver brazing alloy. It can be used in any common copper brazing process, torch or furnace and is specially useful on heavy sections. This is because it has a low brazing temperature (1,225 to 1,275 F).

WESTINGHOUSE ELECTRIC CORP.

For more information on these products, fill in item numbers on cards, pages 17-18

Silver Solder Flux

269 A NEWLY developed paste flux for silver soldering is said to be completely homogenous with no tendency to clot or cake. It is said to rapidly clean off all oxides from the workpieces and aid an even flow of solder through lap, telescopic and diagonal joints.

THE STANDARD SUPPLY CO.

* * *

Weld Cleaning Abrasive

270 RUBBER-mounted abrasives in three "Brightboy" textures are said to simplify finishing problems on aluminum, stainless, plastics, laminated materials and other materials. "Tuff-Tex" grade removes tool and weld marks on steel and other hard alloys. "Fine-Tex" grade is recommended for soft metals and for producing special finishes. A standard texture is available for burring, finishing and cleaning the widest variety of materials and parts.

Each of the three textures is made up in rods, blocks, sticks and wheels for machine and manual applications. A sample card with three working-size "Brightboy" hand tablets, one of each texture, is available from the manufacturer.

BRIGHTBOY INDUSTRIAL DIV., WELDON ROBERTS RUBBER CO.

* * *

Welding Turntable

271 A NEW turntable mechanism for handling weldments, painting large parts or other positioning tasks can be mounted on a bench, a floor or in a pit.

Spindle of the turntable has a 9-in. hole for mounting shafts without special fixtures. Rotating speeds of the table vary from near zero to 1.2 rpm. Precision steel gears provide smooth rotation with a minimum of backlash. A remote-control push-button panel and magnetic reversing starter are standard equipment.

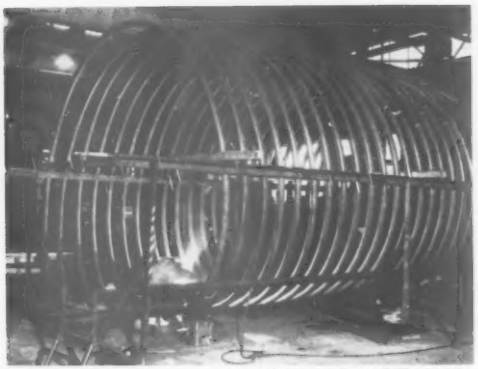
ARONSON MACHINE CO.

* * *

To obtain additional information on listed new products, use the cards on pages 17-18.

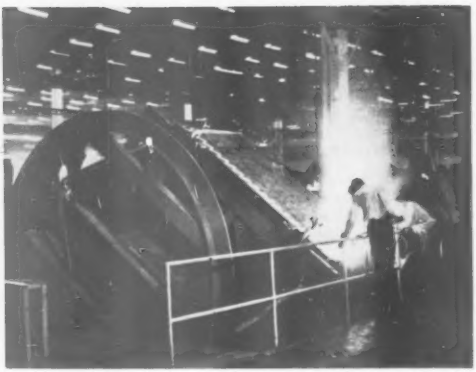
IF IT'S A VALVE
FOR WELDING—
ROSS HAS IT
with Ross Full-Flo In-Line Valve you get Full Pipe Capacity!
THIS
NOT THIS
• Full Line Capacity
• Positive Seal
• High Speed Operation
• Low First Cost
• Low Operating Cost
• Low Maintenance Cost
• Over 500 Straightway and 3-Way Models in ¼"—1¼" Sizes
Ask Ross for Any Air Control Information
Ross makes valves only—hundreds of types and sizes. Take advantage of the experience gained in over a quarter century of concentration on control and application of air power!
Solenoid-Pilot Sections Interchangeable on all 24 Ross-In-Line Bodies.
ROSS
ROSS OPERATING VALVE CO.
THE BRIDLE FOR AIR HORSEPOWER
Engineers at Your Service in all Principal Cities

on the job



Courtesy General Electric Co.

SKELETON of a space ship? It looks like it, but the job this particular weldor is working on is . . .



Courtesy Caterpillar News Service

GIANT rollover fixture speeds welding of scraper bowls at Caterpillar's new Joliet plant. See page 70

Just a Heating Coil

PICTURE above shows how 20-ft lengths of extra-heavy seamless iron pipes 3 in. in diameter are joined together to form this giant heating coil for the inside of a processing tank. After the piping has been bent to the proper shape, it is welded into a continuous coil by means of E-6012 electrodes (for the root bead pass) and E-6010 electrodes (for the finish welds). The welding is being done at the Newark, N. J., plant of the Steel and Alloy Tank Co., a firm whose business is to fabricate heavy pressure vessels and process equipment to meet severe conditions of pressure, temperature and corrosion.

* * *

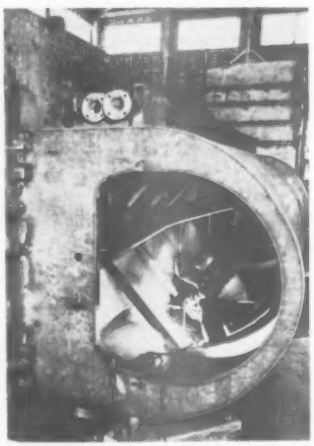
Sky Hook for Painting

By Elton Sterrett

A VERY large oil tank was to be painted, and the problem arose of supporting the "bosun's chair" used by the painter so that it would stay clear of the tank wall. The weldor for the pipeline company had a happy solution.

First step was to attach a 1-in. bolt in the center of the vent at the apex of the cone roof (see picture at center). A socket that would fit snugly over the bolt was then welded to a swivel joint. This, in turn, was welded to an extra-heavy 2½-in. pipe, cut just long enough to extend out beyond the tank eave. Near the end of the pipe at the eave, a light carriage mounting for two rubber-tired castors was attached

PAINTER'S chair is attached to overhanging end of pipe at right



PICTURE is right side up, but the condenser being welded isn't

so that these rollers would ride around the roof of the tank.

A U-bolt was welded below the overhanging portion of the pipe to provide a place for attaching the hook in the painter's block-and-tackle. The rollers and center joint moved with so little friction that the painter when seated in his suspended chair could "walk" himself around the tank without any outside aid whatever.

* * *

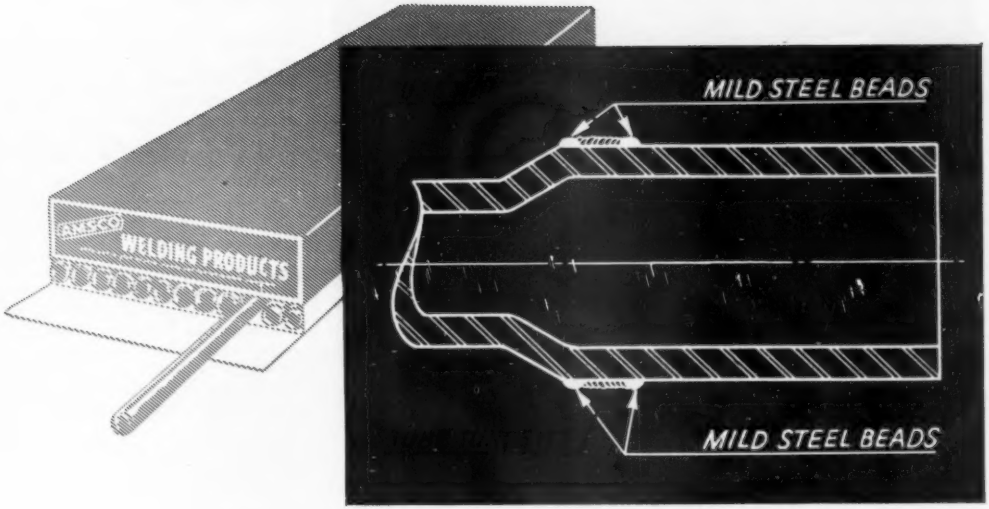
Welding Time Chopped 70%

BY POSITIONING turbine condensers manufactured at the Sunnyvale, Calif., plant of the Westinghouse Electric Corp., welding time has been whacked 70%.

Originally, all welding was performed with the condenser in its right-side-up position. The results were satisfactory, but the time consumed was excessive since vertical and overhead welding had to be done. Now the condenser is turned on its side by an overhead crane and supported by cribbing and a strongback. First one side is welded and then the other. An auxiliary hook on the crane holds the condenser in its unbalanced position while the cribbing and blocking is being moved into place.

The condenser and strongback together weigh about 35 tons. The time spent in positioning is negligible compared to the more than 500 welding hours that are saved on each unit.

With only downhand welding needed, larger electrodes can be used, requiring fewer passes per joint. This means a higher deposition efficiency,



How to increase output by increasing collar life

An example of how Amscoating with AMSCO Hardfacing Electrodes can save materials, manpower, and money.

When you don't have to stop drilling operations because of collar wear, output is bound to go up. Several West Coast drilling contractors report greatly increased service life after Amscoating with Tube Tungsite. It's for this kind of service involving severe abrasion that AMSCO Tube Tungsite is ideal.

In this application, the mild steel bead dilutes the AMSCO Tube Tungsite deposit at the shoulder for greater toughness and high resistance to impact at the point where it's needed most. The Tube Tungsite provides the high level of abrasion resistance in the center section of the collar.

Welders prefer it, too. The excellent weldability of AMSCO Tube Tungsite using either AC or DC makes it highly preferred by welders for the continuous welding of the collars.

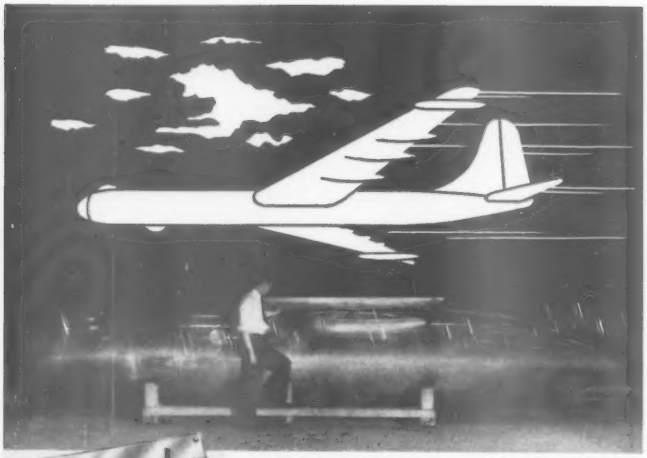
How to Amscoat Drill Collars

This procedure sheet gives complete details . . . the AMSCO electrode to use and method of application. Also lists electrode recommendations for other iron and steel applications. Free copy on request.

AMSCO WELDMENTS
THE RIGHT WAY TO MAKE REPAIRS

Brake Shoe **AMERICAN MANGANESE STEEL DIVISION**
382 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que. Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.



Federal RESISTANCE WELDERS USED IN CONSTRUCTION OF LARGEST KNOWN FUEL TANK

The huge external aircraft fuel tank pictured above is one of a type being produced for the Air Forces by the Ryan Aeronautical Company. Designed by Ryan the tanks are fabricated of aluminum alloys, seam welded to MIL-W-6860 (AN-W-30) on Federal Welders where Ryan is making gas-tight seams without the use of sealing compounds.

Federal Resistance Welding equipment enables Ryan to produce a smoothly streamlined tank that has no external riveting or protuberances to disturb the aerodynamic flow over the skin. Too, resistance welding the tanks eliminates added weight.

High production is another important factor and Ryan, like other aircraft and automotive manufacturers, finds Federal Resistance Welders the most efficient method for producing quality assemblies at high speeds.

The latest Federal Three-Phase Aircraft Spot Welder for welding stainless, aluminum, nickel alloys and carbon steels. If you are interested in Three-Phase Resistance Welding be sure to talk with the Federal Representative in your area. There's a reason why Federal is First in Resistance Welding. Send for your copy of the latest Federal Three-Phase Bulletin.

Federal® WELDERS

THE FEDERAL MACHINE & WELDER CO.

WARREN, OHIO

Warco PRESSES®

ON THE JOB . . . from page 58

and it also means that less time has to be spent in slag cleaning between passes. As further advantages, the welding has a more uniform appearance throughout, and the work is less fatiguing to weldors, who are able to do their work in more comfortable positions.

* * *

It's Done by Air

MANY plants collect such wastes as paper, sawdust and other materials with hand carts, which are emptied into packer trucks. The conventional procedure is to wheel these carts up a ramp onto a loading platform so that they can be dumped into the waiting trucks. That's how it's usually done, but—

At the Burroughs Adding Machine Co., Detroit, the conventional procedure has been changed considerably. A double-acting air cylinder acts on a cable, which upends the cart when the cylinder stroke is down. On the return stroke, the cart is returned gently to the floor.

Here's how the trick is worked. A sleeve has been welded on each side of the waste cart, and a welded structure has been erected on the plant floor. Two arms of the welded structure slip into the sleeves of the cart, which is guided into place for a stablelike entry. The cable, which passes over a pulley, is then attached to the cart, and the air cylinder does the rest.

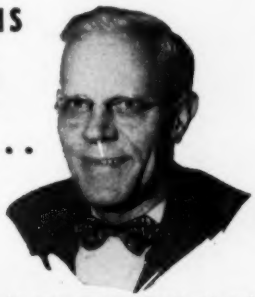
This simple air-actuated device might conceivably be adapted to other material-handling problems facing plant engineers, suggests the Compressed Air and Gas Institute, Cleveland, which sent us the photograph and data.

WHOOSH! Up she goes to dump her load without aid of a loading ramp

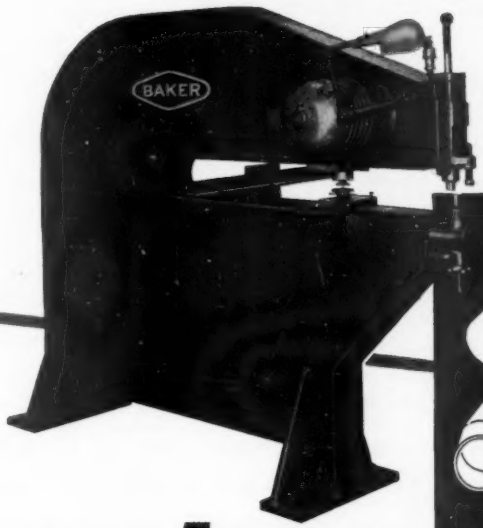
"FOR MANY CUTTING OPERATIONS

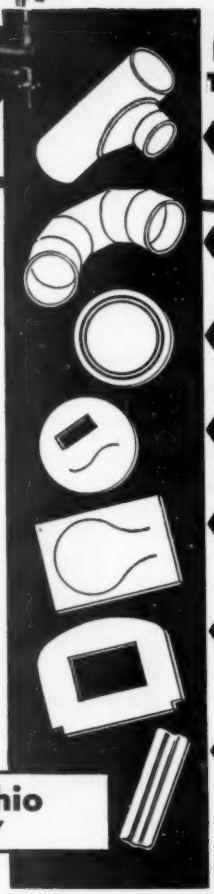
THE BAKER SHEAR

MULTIPLIES OUR PRODUCTION RATE"...



Says Mr. Arthur Christen, Vice-President of The Fred Christen & Sons Company, Toledo, Ohio





DOES ALL THESE JOBS

Quantity 3, no template required.

Quantity 85, save time with template—no layout required.

Beading operation, entirely within sheet—compare with other methods.

Inside cuts, no starting hole required.

Inside cut, no metal removed—parts will mate when finished.

This job was cut in 22% of time of previous method.

Custom or low-quantity beading done with low tool cost.

SAVE TIME 5 WAYS!

Do your heavy duty cutting *faster and better* with the Baker Tru-Edge Contour Shear! It reduces operating time to less than ¼ of the time required on previous machines—as shown by actual cases on record because:

- ★ FAST CUTTING . . . 10 to 36 ft. per minute.
- ★ BURR FREE EDGE . . . No finishing required.
- ★ NO TEMPLATE NEEDED.
- ★ NO STARTING HOLE for inside cuts.
- ★ Cuts various thicknesses without adjusting machine.

Capacity: 6 gauge in mild steel, 7 gauge in stainless steel. Simple in design, only 5 moving parts. Versatile—does many jobs with speed and accuracy. Saves labor. Baker-built dependability.

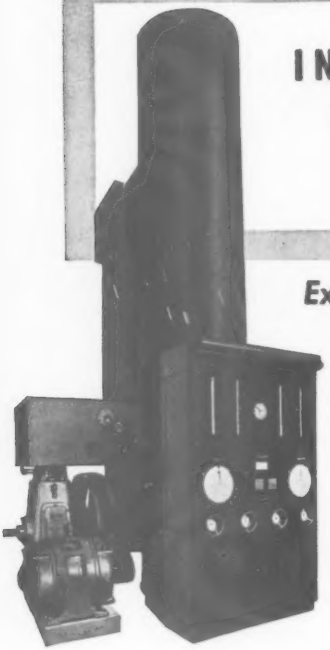
WRITE . . . for illustrated bulletin and price

BAKER BROS., Inc., Toledo, Ohio

Makers of Better Machine Tools . . . Since 1867

The Tru-Edge Contour Shear is made by Baker Bros., Inc., under license from Industrial Devices Corp., Detroit, Mich.

INDEPENDENT
GAS PRODUCING
PLANTS



Expansion Engine Type
Low Pressure
OXYGEN
AND
NITROGEN
Producing Plants

Built in standard sizes—15 meters or 530 cu. ft to 283 meters or 10,000 cu. ft.—in single and double rectification units. If you need them, larger sizes are available.

If the more than one quarter of a million INDEPENDENT CYLINDERS we have built were filled at one time, they would hold more than 50,000,000 cu. ft. of gas!

Furthermore, Independent Acetylene Cylinders hold from 5 to 10% more gas, and the uniformity of the monolithic filler insures even distribution of acetone. Oxygen Storage cylinders available in 12' and 20' lengths; capacities 850 and 1500 cu. ft.

10 C.F. 40 C.F. 60 C.F. 100 C.F. 150 C.F. 250 C.F. 300 C.F. 340 C.F.

WE INVITE YOUR INQUIRIES

INDEPENDENT ENGINEERING COMPANY, Inc.
CONSULTING · RESEARCH · DESIGNING
Manufacturers of
CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN
O'FALLON 5, ILLINOIS

WELDING AT NORTHROP

(Continued from page 42)

tests. If a specimen does not have the shear strength specified, the machine that produced it is taken out of production until the source of the trouble can be ascertained and corrected.

Operators and Designers

A careless or ignorant employee can turn out bad work with the finest and most accurate equipment. Each new man hired at Northrop is given a training to familiarize him with the principles of elementary electricity in general, spot welding in particular. Even if he turns out to be a reasonably competent worker, he must prove that he is keeping abreast of the requirements by taking and passing periodic tests.

Each operator is held solely responsible for his work. He must make sure that his machine is properly set for each new job. Furthermore, he must reject without welding any work that is improperly cleaned or inadequately aligned at the time it reaches his machine.

Northrop engineers have no cut-and-dried rules for the design of parts or assemblies to be resistance welded. They feel, however, that the following factors merit careful consideration before any spot welding is specified.

(1) *Physical properties.* The designer must know the unit strengths that can be expected when a joint is subjected to static or dynamic loads. He must also decide what pattern or what combination of individual points of spot-welded attachments will yield the desired strength in each circumstance. Unfortunately, the available data at this time make it impractical to select each and every pattern on the basis of non-controversial precedents.

(2) *Accessibility.* Assembly points must be able to go into the resistance welder that will be available to do the particular job of joining. This is important. Relatively small variations in the details of assembly components may cause welding to be extremely difficult, if not downright impossible. Northrop designers are expected, therefore, to be thoroughly familiar with the operational characteristics and limitations of their company's resistance-welding machines.

instantaneous control

Only P&H AC Welders have this feature

for faster, easier, sounder welds on non-ferrous and "hard-to-weld" metals

No other welder has this Instantaneous Control feature. Foot-operated, the control provides the heat you call for instantly, *electrically* — not mechanically. No time lag. It's a P&H exclusive that boosts production, cuts costs, saves time.

Inert Gas Welding

Instantaneous control lets you handle "hard-to-weld" metals with ease — aluminum, magnesium, brass, copper, stainless, high carbon, high alloy, and low carbon steels. You get sound welds — X-ray quality every time. No burn-throughs, fewer rejections.

Operators like it, too. It gives them faster, better welds in only five simple steps. Check them:

1. Foot switch automatically turns on power, high frequency, water and gas.
2. Arc starts *instantly* without touching work.
3. Foot switch control provides exact heat needed *while* welding — *no time lag.*
4. Foot-operated control cuts power either gradually or instantly at completion of weld. Eliminates craters — no scrap pieces needed to ruf out bead.
5. Gas and water shut off automatically according to pre-set time delay.

Compare AC Inert Gas Welders, point by point, and you'll buy P&H. Check these outstanding features:

- **P&H Dial-lectric Control** — No moving coils or cores to bind or freeze. Maintenance is absolutely negligible.
- **Built-in high frequency unit** — eliminates additional external equipment. Variable frequency control.
- **Automatic gas and water control** — Pre-set automatic time delay control (2 seconds to 2 minutes) prevents electrode contamination, assures clean, sound welds.
- **Stepless amperage regulation** — from 10 amps to maximum. Three models available — ranges 200, 300 and 500 amps.
- **Unusual arc stability** — Makes good clean welds where extremely low amperages are required.
- **Selector switch** — gives operator instant choice of standard or high frequency unit.

No wonder P&H Inert Gas Welders are the choice of the aircraft industries where top quality work and speed are "musts". They join "hard-to-weld" metals faster and easier — eliminate rejects for you, too. Get full details from your P&H representative or write us for further information.

P&H

WELDING DIVISION
HARNISCHFEGER CORPORATION
4513 WEST NATIONAL AVE. • MILWAUKEE 14, WISCONSIN

2436

POWER SHOVELS • CRAWLER AND TRUCK CRANES • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • DIESEL ENGINES • PRE-FABRICATED HOMES

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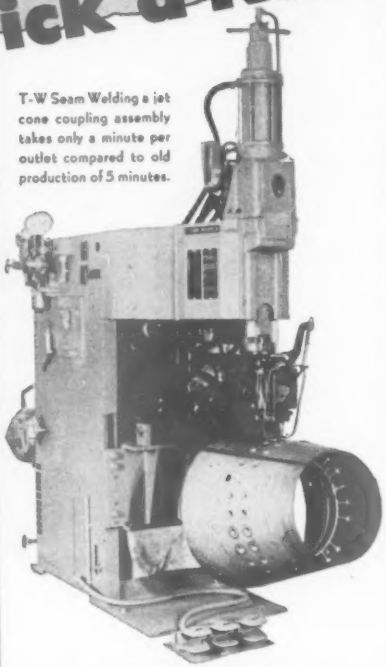
T-W Seam Welding a jet cone coupling assembly takes only a minute per outlet compared to old production of 5 minutes.



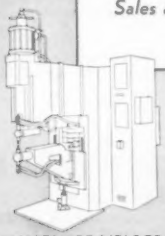
Any one of them uses T-W Resistance Welders to meet Military Specs

● Users of T-W resistance welders have been meeting military specs for some 12 years. When you meet up with the current specifications Mil-W-6860 and 6858 (formerly AN-W-30 and 32), take advantage of this experience. Whether your job is ordnance, aircraft parts, radar, or what have you—you can meet military specifications with T-W welders.

Call on Taylor-Winfield for counsel and assistance on your production. All sizes and styles of resistance welders.

TAYLOR-WINFIELD CORPORATION - WARREN, OHIO

Sales and Service in All Principal Cities



RESISTANCE WELDERS SINCE 1898

TW TAYLOR-WINFIELD
RESISTANCE WELDERS

WARRAGAMBA PIPELINE

(Continued from page 25)

with metal screenings, which set hard in the bituminous compound and afford excellent bonding with the concrete.

Welding into 45-ft Lengths

After these operations for protection against internal and external corrosion, the pipe sections pass to the 45-ft assembly bench. Accurately aligned sliding rollers support the three 15-ft lengths of pipe, which are adjusted to the correct overall length of 45 ft by means of a tension jack. The permissible tolerance of $\frac{1}{8}$ in. on length is readily attained before the sections are tack welded.

Welding of these final circumferential seams is again done by the submerged-arc process. The pipe is rotated at a speed of 20 to 30 ipm, and the welds are made with currents of 600-950 amp, depending on plate thickness. Current is taken from a 1,200-amp d-c welding generator.

The welding heads are fitted with fillet-welding attachments. The fillet sizes conform with Water Board specifications; that is, the nominal size of each fillet is 1/16 in. less than plate thickness and the combined throat thickness may not be less than plate thickness.

Automatic arc welding has governed to a very large extent both the speed and quality of this work. The high current densities, protected arc and self-cleaning welds, coupled with the automatic nature of the operation, bring economies and speeds far in excess of those possible with conventional hand welding.

Six instead of 40 Hours

Labor savings are very considerable. Each 45-ft length embodies approximately 200 ft of longitudinal and circumferential butt joints, 150 ft of circumferential lap joints and 100 ft of circumferential fillet welds. The entire pipe can be welded in an arc time of four to six hours. If manual arc welding were to replace the present submerged-arc methods, the welding time per 45-ft length is estimated at 40 hours.

Manual arc welding is used for the final factory operation, the fitting of the rocker arm brackets. These are

welded in position on the support rings. On completion, slings are placed around the pipe and it is loaded by crane onto the tractor and "jinker" for transport to the field location.

Mobile cranes and specially made straddle trucks are used for unloading the pipes and positioning them onto their foundations. Figure 6 shows a 15-ft anchor pipe being laid with the aid of a straddle truck.

The 45-ft length is lifted by two cranes, which are moved to bring the pipe nearly into correct position. The spigot end is inserted in the socket end of the pipe previously laid, and a short length of bead is deposited at the top of the joint. The other end of the pipe is supported a little high so that, as the pipe is lowered to its correct level, the spigot is pulled into the socket to make a close fit.

Field Welding Job

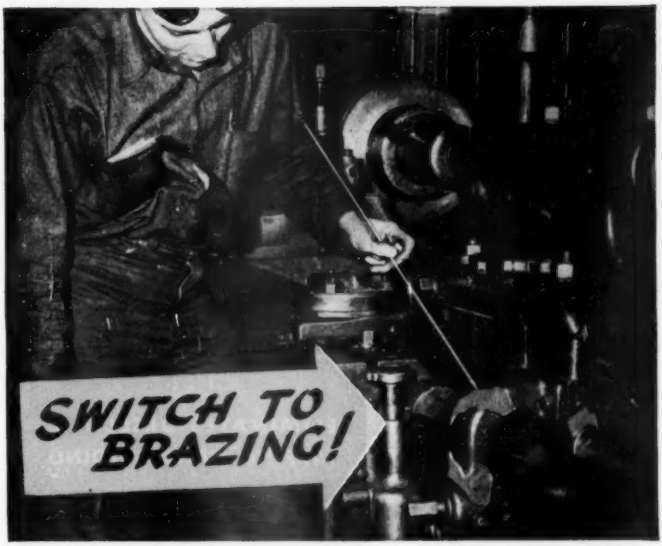
The 45-ft lengths are field welded together to form continuous pipes 560 ft 6 in. long having expansion joints at each end. The field joints are all ball-and-socket lap joints and are welded both inside and out. Inasmuch as possible, welding is done vertically upward.

Figure 7 shows a typical section of completed piping. Each 560-ft length is supported at intervals of 44 ft 9 in. by rocker plates that permit free expansion and contraction. In the design of the expansion joint, only the cement lining or stainless steel is exposed to the water, thus minimizing internal corrosion.

Straight-line anchor foundations contain from 35-50 yards of concrete. The total gravity loading over a 45-ft span is 65¾ tons when the pipe is filled with water. It is the function of the support rings, welded as previously described, to transmit the loading to the supports and stiffen the pipe against distortion.

* * *

The author is indebted to the president and engineer-in-chief of the Metropolitan Water Sewerage and Drainage Board, Sydney, for permission to publish this paper and for the helpful criticism given during its preparation. He would also like to express his thanks to the contracting firms connected with the building of the pipeline for their co-operation and assistance.



Lathe Bracket Welded Right on the Machine with Bridgeport No. 192 Low Fuming Bronze Rod

When the tail stock gear rack bracket on this large heavy-duty lathe broke down, it was repaired quickly and easily with Bridgeport's No. 192 Low Fuming Bronze Rod. The bracket was bolted in place to maintain alignment, then braze-welded.

Because braze-welding requires only local preheating, repairs can be made without dismantling the equipment in many cases similar to the above. Repairs are quicker, easier, much less costly . . . the welds are generally stronger than the base metal itself because the brazed joint is tougher than brittle cast iron.

Bronze welding alloys are also used for building up worn surfaces, as well as for regular production work. Complete information is available in Bridgeport's booklet, "Bronze Welding Alloys." Write for your copy, today.

"Bridgeport" BRASS CO.

BRIDGEPORT BRASS COMPANY
Bridgeport 2, Conn. Established 1865
Mills at Bridgeport, Conn., and Indianapolis, Ind.
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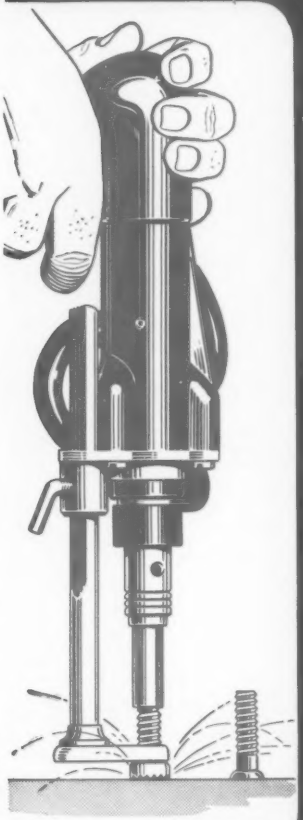
Bronze Welding Rod A PRODUCT OF BRIDGEPORT BRASS

IN STEEL FABRICATION...

HERE'S HOW NELWELD SPEEDS PRODUCTION



AN ELECTRIC ARC WELDING PROCESS

END-WELDS STUDS TO STEEL IN A SPLIT-SECOND

ELIMINATES DRILLING, TAPPING, HAND WELDING

REDUCES MATERIAL HANDLING—TAKES THE TOOL TO THE WORK

NELWELD

SAVES STEEL—ELIMINATES HEAVY BOSSES AND FLANGES

IMPROVES PRODUCT DESIGN AND QUALITY

A NELWELD CLINIC CAN SHOW YOU—

right in your own plant, how you can benefit from this modern fastening method.

Write today for the Nelweld Clinic brochure to Lorain, Ohio.

Fasten it Better...at Less Cost with NELWELD

NELSON STUD WELDING

DIVISION OF GREGORY INDUSTRIES, INC., LORAIN, OHIO

TORCH MAINTENANCE

(Continued from page 46)

vent this low-temperature-melting metal from melting out when the bronze is being deposited, the part is immersed in water.

Clutches and Cylinder Heads

The teeth of cast-iron compressor clutch sheaves and also the center cupped hole become badly worn (Fig. 9). The teeth are machined out, and the base metal is undercut about ¼ in. Next, the sheave is preheated to 800 F, and the bronze-welded deposit is made with the part lying flat in the furnace. The 1 in. by 1½ in. deposit is made in ¼-in. layers that are laid progressively around the wheel like a cork screw. This method prevents the part from warping. The part is 24 in. in diameter, and the rim section is about ¾ in. thick. Following welding, the part is left in the furnace for three days to cool. The wheel at the right of Fig. 9 is in the as-welded condition, and the one at the left has the gear and center hole machined.

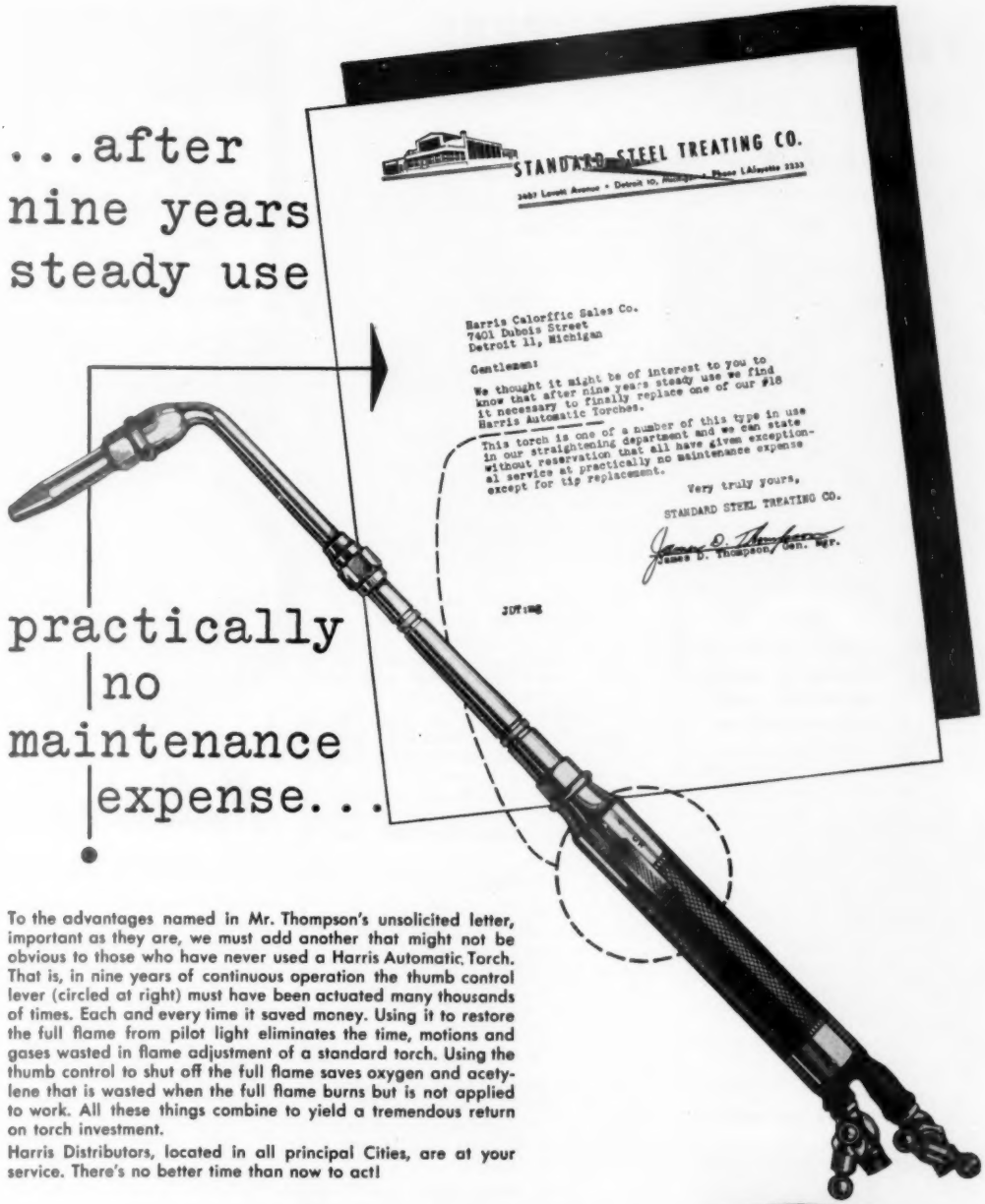
One of the most costly Diesel locomotive parts reclaimed is the cylinder head. Cylinder heads are subject to severe service that brings about a need for considerable maintenance. Figure 10 shows how the valve seats and injector hole are built up. Heads are first cleaned, and then all worn and cracked areas are machined in preparation for welding. The head is placed in one of a battery of charcoal-fired ovens and preheated to 1,400 F. Carbon plugs in the valve seat openings and a steel disc in the injector hole hold the molten welding metal in the desired locations. Cracks at stud holes are also welded.

A large tip is used with a ¼-in. cast-iron rod, oxygen at 40 psi and low-pressure acetylene. Following welding, the furnace is closed up and the part is left to cool slowly over a three-day period. The hardness of the deposited metal is about the same as the base metal, and a minimum of trouble has resulted from porosity or inclusions. At the left in Fig. 11 is a head as-welded and on the right a head after machining operations.

I feel sure that the uses of the flame I have covered are standard and will reflect the other applications that I have been unable to cover.

...after
nine years
steady use

practically
no
maintenance
expense...


STANDARD STEEL TREATING CO.
Harris Calorific Sales Co.
7401 Dubois Street
Detroit 11, Michigan
Gentlemen:
We thought it might be of interest to you to know that after nine years steady use we find it necessary to finally replace one of our #18 Harris Automatic Torches.
This torch is one of a number of this type in use in our straightening department and we can state without reservation that all have given exceptional service at practically no maintenance expense except for tip replacement.
Very truly yours,
STANDARD STEEL TREATING CO.
James D. Thompson, Gen. Mgr.

To the advantages named in Mr. Thompson's unsolicited letter, important as they are, we must add another that might not be obvious to those who have never used a Harris Automatic Torch. That is, in nine years of continuous operation the thumb control lever (circled at right) must have been actuated many thousands of times. Each and every time it saved money. Using it to restore the full flame from pilot light eliminates the time, motions and gases wasted in flame adjustment of a standard torch. Using the thumb control to shut off the full flame saves oxygen and acetylene that is wasted when the full flame burns but is not applied to work. All these things combine to yield a tremendous return on torch investment.

Harris Distributors, located in all principal Cities, are at your service. There's no better time than now to act!

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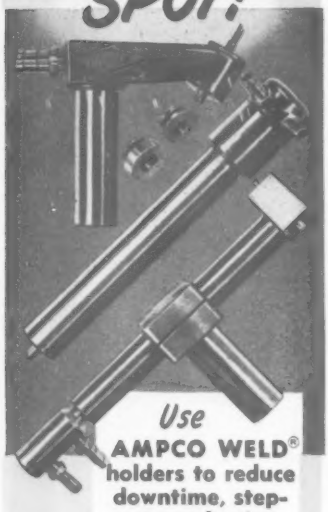
SERVING THE METAL INDUSTRY SINCE 1905

Put resistance welding costs on the SPOT!



Use **AMPCO WELD® holders to reduce downtime, step-up production**

There's an AMPCO WELD® holder for every resistance-welding job — offset ejector holders, straight ejector holders, universal ejector holders. All are leak-proof. Made of high-conductivity Ampco Bronze alloys, they meet or exceed RWMA specifications to give you trouble-free operation, longer runs, reduced downtime, and increased output.

. . . AMPCO* Engineering Service when you need it

Behind the famous AMPCO WELD® line of resistance-welding products is a corps of experienced engineers, ready to help you solve your problems. Just get in touch with us.

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AMPCO® MILWAUKEE 46 WISCONSIN

RW-3

West Coast Plant, Burbank, California

It's production-wise to Ampco-ize!

*Reg. U. S. Pat. Off., Ampco Metal, Inc., Milwaukee

30 YEARS

(From THE WELDING ENGINEER of July, 1922)

DON'T charge the wandering motor car tourist too much this summer if he needs a welding repair job, cautions the editor. Just because a man is as much as 300 miles away from home he won't soon forget a $5 overcharge and the whole welding industry suffers at his reaction.

—30 YEARS AGO—

THE Bastian-Blessing Co., Chicago, has purchased the Torit line of welding and cutting equipment from the St. Paul Welding and Mfg. Co., St. Paul, Minn.

—30 YEARS AGO—

A TECHNICAL paper on the gas welding of pressure vessels is published in this month's WELDING ENGINEER. Author is S. W. Miller, researcher for Linde Air Products Co.

—30 YEARS AGO—

A LEATHER sample case for welding rod salesmen has been brought to our attention. As devised by Mr. A. D. Lansing, the case has five pockets, each large enough to hold four 5 by 1 by 1¼ in. metal strips. One pocket is for cast iron, the others for steel, copper, brass and aluminum. In any particular pocket one strip shows the metal beveled for welding, one shows the finished weld, another shows its ground down and the final strip shows the welded seam nickel-plated.

—30 YEARS AGO—

THE American Electric Fusion Corp., Chicago, recently increased its capital stock from $30,000 to $40,000 and chose for officers the following men: E. J. Henke, president, A. B. Sonneborn, vice-president and G. F. Strand, secretary and treasurer.

—30 YEARS AGO—

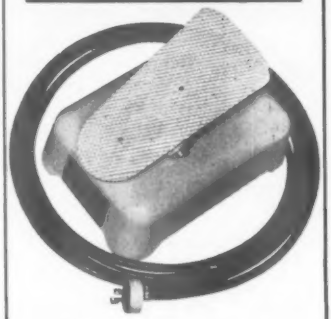
METAL & Thermit Corp. suffered a loss of $50,000 on June 24, 1922, when a fire destroyed one of the buildings at its plant on Cornelson Ave., Jersey City, N.J.

—30 YEARS AGO—

FROM the editors desk: "Testing welds by electrical and magnetic apparatus has recently been accomplished on a small scale, with a probability that such apparatus can be further developed to replace present-day destruction tests. X-ray testing is another possibility of great promise which has not so far progressed beyond the laboratory stage."

Vary the welding heat at the Work

instead of the welder!



Mullenbach

ARCTROL

Provides *portable* voltage control at the work; selects the exact welding heat for every job *without walking back to the welder!* Retains full welder heat range; saves hours; makes better, more uniform welds. *Handiest aid any welder ever had*—for precision welding, for production jobs!

Available for most makes of D.C. arc welding machines. Write for descriptive ARCTROL circular, giving make and model number of your welder!

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Electrical Manufacturing Co.

2300 East 27th Street, Los Angeles 58, California

A STABLE ARC, GOOD DIRECTIONAL CONTROL, AND WIDE USEABILITY CHARACTERISTICS ENABLE YOU TO . . .

Weld Stainless Easily in ALL Positions with G-E Stainless Steel Electrodes

Excellent Delivery on Most of the 36 Types Assures You of the Right Electrode for Every Job

You get the most for your dollar when you buy General Electric stainless steel electrodes. Here are seven reasons why:

1. You get excellent handling characteristics in *all positions*.
2. You get good directional control because G-E stainless steel electrodes give you a very stable arc.
3. You get the minimum of spatter and can remove slag easily.
4. You can select the correct electrode for every application because G.E. offers industry a complete line of chrome and chrome-nickel types.
5. You can get G-E stainless steel lime-coated electrodes for reverse polarity DC and titania-coated rods for AC and reverse polarity DC.
6. You get the correct metallurgical deposit your specific job requires.
7. You get excellent physical properties in the bead itself.

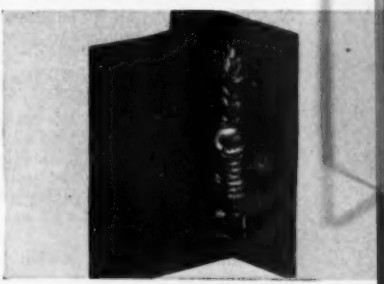
See Your G-E Welding Distributor!

He can help you select the best, most economical electrode for your specific stainless steel welding job. Delivery is excellent on most types.

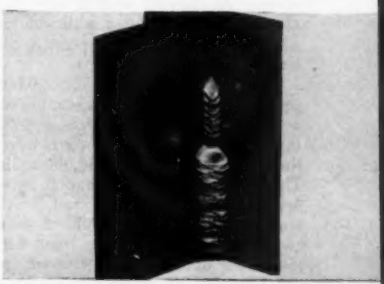
Your G-E welding distributor also carries a complete line of other electrodes, accessories, AC, DC, Inert-Arc and Atomic Hydrogen welders. You can find his name by looking for General Electric under "Welding Equipment" in the classified pages of your telephone directory. *General Electric Co., Schenectady 5, N. Y.*

712-19

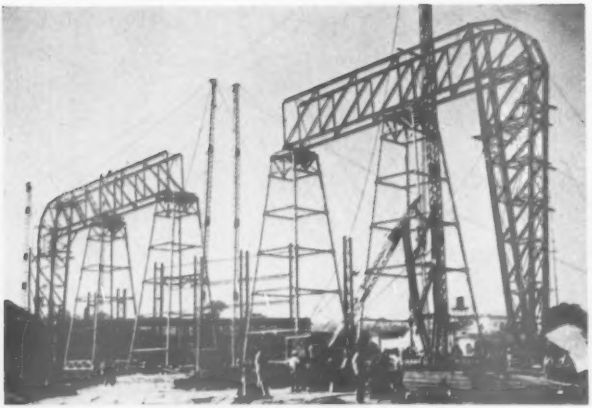
GENERAL ELECTRIC



SMOOTH, NEAT WELD made with lime type W-1310, reverse polarity DC electrode.



VERTICAL FILLET weld made with W-2310, titania type, AC or DC reverse polarity.



CLEAR SPANS of 328-ft mark world's biggest welded rigid frames going into Mexico City's new municipal auditorium. Building will seat 18,500

KID-LEVEL welding lenses were provided for Caterpillar's Joliet plant open-house

NEWS

Joliet Caterpillar Plant Keeps 500 Weldors Busy

A MASSIVE display of welding equipment and manpower was evident to visitors at the recent open house of Caterpillar Tractor Co.'s new Joliet, Ill., plant. Fabricating bulldozers, scrapers, rippers, wagons and power controls there are more than 500 weldors, out of a total of 3,000 employees.

To give an idea of the amount of welding being done, every No. 90 scraper bowl takes 1,934 ft of welding rod alone. Last year, when the plant was just beginning its production, more than 1,772 miles of welding rods were deposited.

Watching one welding station in operation was easy for visitors—a special "knot hole" club welding shield was set up for them. (see above) At varying heights were rectangular openings fitted with welding filter lenses so that 10-year-olds could see as well as 60-year-olds.

The plant now has about 700,000 sq ft of floor space. Already underway however, is an addition of 280,000 sq ft as well as a new parts warehouse that will occupy 230,000 sq ft. The plant site consists of 305 acres and has ready access to rail, truck and waterway transportation. A solid rock foundation under the plant furnishes the finest type of support for heavy machine tools and presses.

Products made at the plant include 27 models of bulldozers, 9 models of scrapers, 2 sizes of rippers, 2 models of tractor-drawn wagons and 6 models of cable and hydraulic controls for operating dozers and scrapers.

* * *

Biggest Welded Frames For Mexican Auditorium

SCHEDULED for completion this summer is Mexico City's new $4,500,000 municipal auditorium, which includes eight of the world's largest welded rigid frames. They have a clear span of 328 ft, according to The Lincoln Electric Co.

The eight frames are arranged in a pie-shaped layout that will provide seating space for 18,500 people. Welded construction saved 50% in weight, such savings being essential because of sandy subsoil conditions, states Macomber De Mexico, fabricators and erectors. Some 6,000 tons of structural steel were put up, using E-6010 and E-6012 electrodes.

* * *

Win $300 By Naming New A. O. Smith Welder

FAST action in a new A. O. Smith "Cash for a Name" welding contest can win you a $300 first prize. Closing July 12, 1952, the contest will produce a name for a new gasoline-engine-driven d-c arc welder. Second and third prizes of $200 and $100 are also offered.

The contest is open to all users of welding equipment except A. O. Smith employees and employees of its advertising agency. Readers of welding magazines are especially welcomed to try their naming luck, says A. O. Smith.

Here are the facts on the new welder: 200 amp NEMA rated capacity, operated by a 34 hp liquid-cooled industrial gasoline engine. The engine has magneto ignition and automatic idling control of the electric type. Modern design of the motor, welder and mounting cuts weight to 995 lb.

Contest entries must be postmarked before midnight July 12, and on their way to A. O. Smith Corp., Welding Products Div., Dept. WE652, Milwaukee 1, Wis.

* * *

Weld Heat Fatigue Data Offered by AWS

EFFECTS of high temperatures and rapidly changing temperatures on weldments are discussed in a new bulletin, "Thermal Fatigue and Thermal Shock," published by the Welding Research Council. Written by Helmut Thielsch, it covers effects of stresses, intergranular oxidation, phase transformations and welding. Examples of thermal fatigue and shock failures in refineries, power plants and processing industries are given and discussed. There are 29 illustrations and 59 references to published and unpublished information. Copies may be purchased at $1 each from the American Welding Society, 33 West 39th St., New York City 18.

Put **SAFETY** *and* **SAVINGS**
in the palm of your hand!

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PENOPTIC*

INDUSTRIAL LENSES

For more savings and quick service, order "Penoptic" quality industrial lenses *direct*. There's *always* a complete assortment of welding lenses, welding blanks, safety lenses and clip-on goggles in stock! All orders are filled and shipped immediately. No waiting. For more than a quarter of a century the Pennsylvania Optical Company has supplied industrial lenses made by men with experience and know-how in producing precision ground and polished lenses. Write, wire or phone for information on the complete line.

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Here is the LOW COST way to . . .

REBUILD Gyratory Crushers!

MANGANAL

U.S. Patents 1,876,738—1,947,167—2,021,945

11%-13½% Manganese-Nickel Steel ROUND APPLICATOR BARS

. . . Put Your Equipment Back to Work Faster!

MANGANAL — the toughest metal known — work hardens under impact and abrasion to 550 Brinell . . . tensile strength up to 150,000 p.s.i.

GYRATORY CRUSHERS rebuilt with MANGANAL usually outlast new ones.

MANGANAL ROUND APPLICATOR BARS are available in 11 sizes for all conditions of wear.

Use MANGANAL Bare or Special *TITE-KOTE ELECTRODES* to fill in low spots on Gyratory Mantles and to attach Applicator Bars.

FREE

Literature on the latest methods for speedy and economical repair of worn equipment.

Name of nearest distributor on request.

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SOLE PRODUCERS 92 N. J. RAILROAD AVE. NEWARK, N. J.

eyes need THE ORIGINAL CHAMPION EYEGARDS with 10-way ventilation

BEST THING NEXT TO YOUR EYES

Your workers benefit—and you benefit—when you buy Eyegard Goggles. They get the finest in comfort and protection—you get a savings in cost. Eyegard Goggles have built-in comfort because the super-light plastic "form-fits" the face . . . have greater protection because the goggles are impact-resisting . . . have extra ventilation through three large vents at side of cup and seven additional vents around lenses. Cool and fog-free. Price will surprise you—get the information today. Write for free catalog.

AMERICAN INDUSTRIAL SAFETY EQUIPMENT CO.

3503 LAKESIDE AVENUE CLEVELAND 14, OHIO

DIVISION OF THE BURDETT OXYGEN CO. CLEVELAND, OHIO

Illustrated is the No. 335 Welders Coverspec Goggles. A wide range of other types are available at savings.

Lampton Welding Moves to New Wichita Plant

CAPPING a fast 5½-year growth, Lampton Welding Supply Co., Wichita, Kansas, transferred its operations in May to an attractive new sales and warehouse building. According to M. L. Lampton, president, the measurements of the building are 40 by 132 ft with a big 60 by 132 ft parking lot next door. Two truck access doors 13 ft high are provided.

An open house for customers, manufacturers' representatives and friends was staged May 24 by the company. A dinner for 25 people was given at that time for suppliers, employees and their wives.

Present employees of the Lampton firm, which was started Oct. 1, 1946, are shown in the above picture. Left to right, they are: Mr. Lampton; Margery Hurd, bookkeeper; Gene Clyborne, counter salesman; Lloyd Creed, driver salesman; James Finke, office manager; Howard Stauffer, salesman and Roy Whitt, salesman.

Among suppliers the company represents are The Lincoln Electric Co., Linde Air Products Co., P. R. Mallory & Co., and Tweco Products Co.

* * *

16 New Members Join Welding Supply Group

ENTHUSIASTIC membership recruiting at the May convention of the National Welding Supply Association in Chicago netted the group 16 new members. They are: Baker's Gas & Supplies, Detroit; Blue Valley Welding Supply, Allentown, Pa.; Braun Welding Supply, Lafayette, La.; Chicago Tool & Engineering Co., Chicago; C. B. Herrick Co., Cleveland; Hobart Welder Sales & Service, Chicago; Industrial Supplies, Inc., Huntington, West Va.; Jacobs Welding Supply, Davenport, Ia.; Lincoln Welding Supply Co., Lincoln, Nebr.; Linox Welding Supply Co., Chicago; McDonald & Wilson Sales Co., St. Louis; D. D. Richards Supply Co., Garnett, Kansas; South Side Welding Supply Co., Chicago; Superior Welding Supply Co., Milwaukee; Viking Products, Div. Progressive Welder, Detroit, Wilson & Stokes Co., Trenton, N. J.

75% Production Boost Made by Sellstrom

INCREASED production of eye and face protective equipment by Sellstrom Mfg. Co., Chicago, is 75% over last year. The floor space at the Chicago factory was expanded about 35% to boost production rates and in addition, a branch factory at Grays Lake, Ill., was put in operation.

Three additional plastic moulding machines have been installed, making a total of seven. The largest of these will mould two welding helmet window frames in one operation.

A new 2½-cu ft airless-blast cleaning machine takes off surplus plastic from goggle eye cups and helmet window frames. A large quantity of eye cups and frames can be cleaned by this method at the same time with a brighter finish than formerly.

Other new equipment includes a beveling machine that utilizes emery cloth to shape the edges of welding filter plates, an electronic grading machine for welding plates and goggle lenses, and a new hardening oven for treating lenses. Stock and shipping rooms at the Sellstrom plant have been expanded to handle the larger production volume. This is the 29th year in business for Sellstrom, one of the leading manufacturers of eye and face shielding devices.

* * *

Chartered Plane Speeds Electrode Holder Order

LESS than two hours between telephoned order and delivery 190 miles away was a mark set recently by Wagner Mfg. Co., Jackson, Mo. A shipment of Wagner electrode holders was needed as fast as possible by Standard Welders Supply Co., Memphis, Tenn.

To speed the holders on their way south, Wagner's managing director, Paul J. Leonard, chartered a Cessna airplane at the Jackson airport. Piloting the plane was George C. French, Wagner office manager.

Rolling to a stop at the Memphis airport, pilot French was met by T. A. Vinson, city salesman for Standard Welders' Supply and Miss Ruth Leverette, secretary for the distributor.

* * *

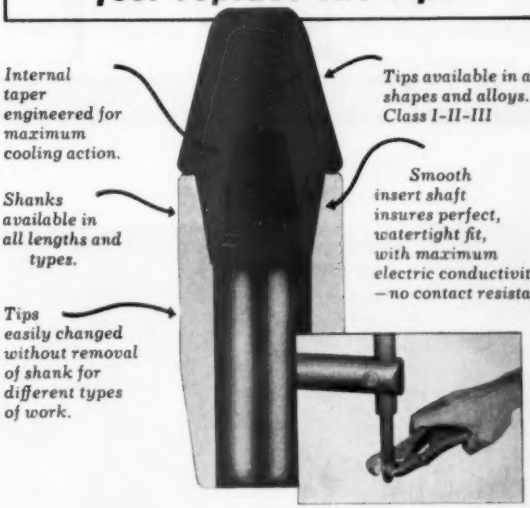
New Address for Pacific Valves

ESTABLISHMENT of new headquarters in the Boothe Building at 475 Huntington Drive, San Marino, Calif., has been announced Pacific International Products, Inc., manufacturers of valves for acetylene, oxygen, hydrogen, nitrogen and other compressed gas equipment.

REDUCE COSTS
with *replaceable*
PACIFIC
SPOT WELD INSERT TIPS
fully watercooled

The original and best... Patent No. 2,440,463

Don't remove the shank *just replace the tip!*


Internal taper engineered for maximum cooling action.
Shanks available in all lengths and types.
Tips easily changed without removal of shank for different types of work.
Tips available in all shapes and alloys. Class I-II-III
Smooth insert shaft insures perfect, watertight fit, with maximum electric conductivity —no contact resistance.

PACIFIC TIPS are the famous *replaceable* spot weld tips that are *irreplaceable! Accept no substitutes!* For finest performance at lowest cost be sure you get PACIFIC. Scientific design fully protected by patent. Save money and time—help save critical copper. Less machine down time, less inventory needed, less machine wear. PACIFIC Shanks fit standard Morse Taper Holders. Use in machines, portable guns... in straight and offset holders. Get complete information and prices today.

DISTRIBUTED BY

A. C. JOHNSON CO.
5721 Indianola
Indianapolis 20, Ind.

F-H WELDING MACHINES, LTD
43 Victoria Street
Toronto 1, Ontario, Canada

STOFFREGEN SALES & ENG. CO
430 W. Acacia Road
Milwaukee, Wisconsin

H. F. MERCHANT
808 West Avenue
Jenkintown, Penna.

C. G. WILSON CO.
(ANDREW BROWN)
1911 West Alabama
Houston, Texas

PACIFIC ELECTRODE CO
6230 Maywood Avenue
Bell, California

F-H WELDING MACHINES LTD.
444 Pitt Street
Windsor, Ontario, Canada

A. P. SEEDORFF CO., INC.
6230 Maywood Avenue
Los Angeles, California

C. G. WILSON CO
1501 South Akard
Dallas 1, Texas

Smith Bros. & Hughes, 5304 Banks St., San Diego 10, Calif.

Manufacturers—Resistance welding electrodes and accessories ...aircraft components ...automatic screw machine products

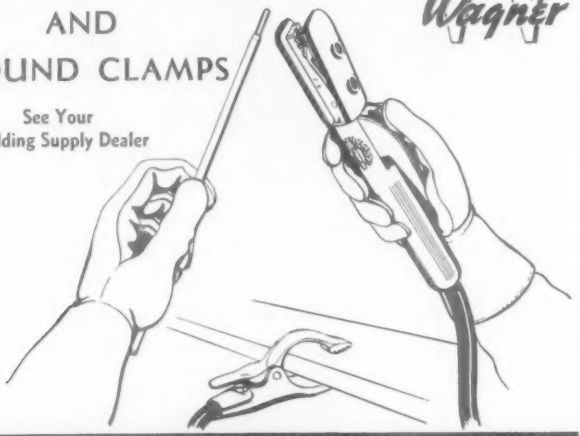
Inquire for distributor and dealerships.

WAGNER ·· Pioneers

Weld with Wagner

QUALITY ELECTRODE HOLDERS AND GROUND CLAMPS

See Your Welding Supply Dealer



WAGNER MANUFACTURING CO. Inc. JACKSON MISSOURI

Group of RUEMELIN Fume Collectors Keeps Shop Clear of Welding Fumes

This well ventilated welding department is typical of hundreds of similar installations. Welding operators appreciate smoke and gas-free atmosphere. Thousands in service. Many repeat orders. Collecting fumes at the source with local exhaust hoods has proven most practical in operation. It is particularly helpful in winter months when doors and windows are closed. Write for Bulletin 37-D describing all types of Ruemelin Fume Collectors.

RUEMELIN MFG. CO.

MFRS. & ENGRS. • SAND BLAST & DUST COLLECTING EQUIPMENT

3880 NORTH PALMER STREET • MILWAUKEE 12, WISCONSIN, U. S. A.

Biggest Caisson Bridge Saves 2,125 Tons by Welding

THE world's largest caisson bridge, and today the widest bridge over the Rhine river, is in operation between Dusseldorf and Neuss. Its three spans are 340, 680 and 340 ft, respectively, and its width is 99 ft. The new bridge replaces a latticed-girder bridge, built on the same piers but destroyed by the retreating German army in 1945.

Welded design contributed considerably to a saving of 2,125 tons of steel over the old design. The weight of steel per square foot amounts to 104.5 lb. All girders and other components were welded in structural shops and transported to the river. Field assembly was by riveting. The largest welded components measured 25 by 75 ft and weighed 55 tons. Total length of welded seams was 125 miles. A newly developed steel designated as HSB-50, specially suitable for welding, was used. Design and technical management was carried out by Hein, Lehmann & Co., A. G., Dusseldorf.

—McGraw-Hill World News

* * *

Wiese Plow Welding Gets Second Hammer Forge

WORKMEN have completed installation of a new 2,000 lb drop hammer forge in the plant of Wiese Plow Welding Co., Inc., Perry, Ia. This is the second such forge installed at Wiese in the last two years and will permit the manufacturing of from 10,000 to 12,000 plow points and cutting edges per 8-hour day. Heretofore the company had to purchase some outside forge work, according to Martin J. Miller, production manager. Wiese is a leading manufacturer of reclaiming parts for farm tilling tools.

* * *

"All-purpose welding helmet, eh Joe?"

Giant Betatrons Speed Tank Production

BETATRONS are now being used to help speed production of armor steel castings for the Army's battle tank program. Three new 24,000,000-volt betatrons, the first ever built for industrial operation, were recently constructed for the Army Ordnance Corps under supervision of the U. S. Army Engineer Corps.

Previously used only in experimental physics labs and for medical research, the betatron is now recognized as one of the most advanced scientific tools for non-destructive testing. It permits fast, accurate inspection and quality controls. Its X-ray film records through metal sections up to 24 in. in thickness. The rays can penetrate 7 to 9 in. of armor steel in little more than a minute.

The betatron is the largest inspection instrument ever adapted to foundry use. Suspension requires a 7½ ton crane. A telescopic arm between crane and machine allows rotation and tilting to focus rays on any desired section of the material under inspection.

Installations are housed in specially-constructed, windowless buildings for protection against radiation. Complicated safety measures are provided for personnel at all times.

The three massive units are being operated for the Army in the armor-producing plants of General Steel Castings Corp. at Granite City, Ill., and Eddystone, Pa., and by Continental Foundry & Machine Co., East Chicago, Ind.

* * *

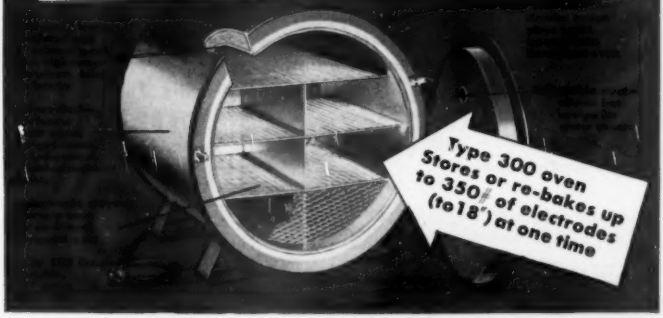
Progressive Welder Buys Canadian Plant

THE P. D. Bates Co. Ltd. plant at Ridgetown, Ont., has been bought by Progressive Welder Canada Ltd. This gives Progressive two plants in the dominion, totaling 24,000 sq. ft. The other facility is at Chatham, Ont., where main offices were located until the present purchase. Ridgetown will be headquarters henceforth.

All types of resistance welding equipment and fixtures will be produced in the newly purchased plant. The latter will also house the metal stamping division. Equipment for this division includes 30 presses ranging in capacity up to 100 tons, a die shop, a zinc plating and carburizing department and electric annealing ovens.

New sales engineering offices have been set up in three cities: Toronto at 29 Adelaide St., Windsor at 29 Park St. and Montreal at 630 Dorchester St.

New DryRod Electrode Oven



gives 4-way savings to users of low hydrogen, stainless steel electrodes

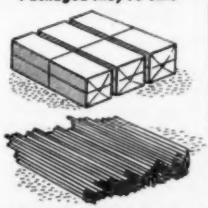
For a few cents a day DryRod protects mineral coatings against moisture absorption. Gives you a low-cost system of control for better welds at point of use.

1. **Stops rod scrap loss**— normal temperature range (175-325°F) safe-holds freshly unpackaged rods. Higher range (325-550°F) re-bakes those exposed to humidity for longer periods.
2. **Eliminates costly rework**— with *dry* coatings you can *be sure* of high quality welds. Stops under-bead cracking, X-Ray porosity, rough welds, rework.
3. **Faster welding**— preheating plus drying gives electrodes *consistent* quality . . . higher production per hour . . . lower unit costs.
4. **Efficient, safe storage**— orderly, convenient, mobile...provides electrodes in the right condition at time and place needed.

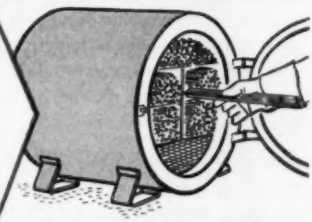
NOTE—DryRod is now sold as well as manufactured by Phoenix Products Co., whose engineers were active in its original design and development. Write for the money-saving facts on this *pioneer* electrode oven NOW!

How DryRod System of electrode control saves you money

Packaged they're safe



1-POINT STORAGE
Once sealed cartons are opened and electrodes placed in the DryRod, protection is automatic . . . original "baked-in" quality is consistently preserved. Speeds up production . . . oven is always convenient to welders for replenishing stock.



Unpackaged they're perishable

Always ready for convenient use

Phoenix Products Co.

DryRod *Electrode Oven*

DryRod—always made by, and now sold by PHOENIX

WRITE FOR FULL INFORMATION

Phoenix Products Co.
4715 N. 27th St., Milwaukee 16, Wis.

☐ Send bulletin DR-1A, describing Type 300 Oven

☐ Send chart showing recommended temperatures for various types of mineral-coated electrodes

Name_____

Company_____

Address_____

City_____ State_____

PR-2 DryRod — Trademark

HELPFUL TIPS ON HARD SURFACING

A new welding procedure has been developed to help the maintenance man keep equipment rolling. If you are down and under equipment during otherwise productive working time, you are wasting money.

To avoid production delays on parts such as asphalt pulverizer paddles, mixing blades, hammers, etc., RANITE "NO. 4" electric is recommended with the amazing results obtained by the new slow cooling procedure described in detail on Form C-X and Form B-4 available from Rankin Manufacturing Company, 3072 West Pico Boulevard, Los Angeles 6, California.

Electric RANITE "NO. 4" has a smooth flowing metallic coating, and while this slow cooling procedure is a new development, the instructions are simple to follow and the rod is easy to apply in the field or shop.

With an overlay of RANITE "NO. 4" the use of costly base metals is not necessary, and will reduce costs by permitting the use of cheaper, more ductile materials resulting in far better service life and less breakage.

RANITE "NO. 4" is a moderately priced rod designed for the severest action. Use this rod and new method of application for your toughest jobs, because it has proved to be the answer to the maintenance man's lost production.

Dutch Weld Big Tanks With Inert-Arc

ALUMINUM storage tanks 28 ft in diameter and 33 ft high are being inert-arc welded by Nederlandse Koper Metaal Industrie, Delft, Holland, according to word received by Linde Air Products Co. About 450 ft of seams are put into each tank to join ½-in. plates. Capacity of the tanks is more than 1,000,000 gallons. They're so big they have to be transported by canal barge.

* * *

Dr. Krivobok Speaks at Aircraft Materials Meet

A metallurgical specialist in stainless steel, Dr. V. N. Krivobok, was scheduled to be the speaker at the Aircraft Materials and Process Seminar held at El Camino College, El Camino, Calif., June 2 through June 13. The series of six sessions were held Mondays, Wednesdays and Fridays during the two weeks. Krivobok is in charge of the stainless steel section of the development and research division of The International Nickel Co., Inc. Thomas E. Piper, chief materials and process engineer, Northrop Aircraft, Inc., Hawthorne, Calif., acted as coordinator of the sessions.

* * *

15,000-Ton Forge Press Working at Alcoa

LARGE aluminum forgings for jet aircraft are being turned out on a 15,000 ton German forge press recently put in operation at the Cleveland works of Aluminum Company of America.

Housing the giant press required erection of an aluminum-clad building 5-stories high. A special overhead crane was installed to lift parts weighing up to 120 tons as the press was reassembled. The foundation required 1,000 cu yd of concrete.

For some jobs, a set of dies for the press will weight 25 tons. Built early in World War II by the Schloemann Co. of Dusseldorf, the press was used in Germany's light alloy industry. Several American companies are building 35,000 and 50,000 ton presses that are expected to be installed in 1951.

ALUMINUM WIRE

AWP

"ALLOYS WITH PURITY" FOR WELDING & BRAZING

AWP Aluminum Welding Wire offers the welder an aluminum welding wire specifically designed for Argon or Heli-Arc applications where clean oxide and dirt-free surface is imperative. Manufactured by a modern process AWP Aluminum Welding and Brazing Wires will enhance the speed strength and efficiency of your welding. AWP Aluminum Welding and Brazing Wires are available in all standard alloys and forms.

ALUMINUM WIRE PRODUCTS CO., INC.
9 Naubuc Ave., Glastonbury, Conn.

"Red Head" WELDING CLAMPS

• Designed for Welding •

No Threads To Damage

1. Case Hardened threads are always protected from weld spatter and never exposed to damage in open or closed position.

2. The clamp body is cut from solid plate, thereby insuring extreme rigidity and giving great resistance to bending or twisting.

3. Heat treated chrome molybdenum alloy handle offers great resistance to bending.

23 stock sizes

CHICAGO BOILER COMPANY
1969 CLYBOURN AVENUE
CHICAGO 14, ILLINOIS

Coated Abrasives Checked By Beta-Ray Gages

A NEW production control technique in use at Carborundum Co., Niagara Falls, N. Y., utilizes beta-ray gages in the coated-abrasive production line. The five gages in use are actuated by sealed capsules of Strontium-90, a radioisotope which lasts 30 years.

The five gages continuously assess weight of backing, weight of adhesive, weight of abrasive, weight after precure and weight after final adhesive application on a line that travels up to 350 ft per minute.

In operation, the Strontium-90 capsule emits beta rays through the moving belt to a special detector. Beta rays that get through the detector ionize a gas and create a voltage that provides a recording and controlling signal. Since the gage is calibrated, variations in beta-ray transmission cause changes in signal that vary directly with change in weight per unit area.

According to Carborundum's William A. Wendel, vice-president and manager, coated products division, this installation is the first of its type in the abrasives field. Up to now, production control has been on a cut-and-try basis. This required stopping of machinery, cutting out an edge sample, checking the sample, readjusting rolls and feeds. Overshooting on specifications was common to make sure of meeting minimum thickness and density standards. Automatic controls not only eliminate costly and inaccurate manual testing, but reduce machine downtime, allow savings in the expensive materials used (resins, adhesives, aluminum oxide, silicon carbide, garnet) and prevent wastage of processed materials.

The new technique was worked out with the cooperation of specialists from the Industrial Nucleonics Corp., Columbus, O.

• • •

The greatest of faults, I should say, is to be conscious of none.—Thomas Carlyle

an ACCO product for Stainless Steel WELDING

AC-DC Electrodes

GAS Welding Rods

made by

PAGE

BURNING...
stable even at lower heats

SLAG...
clean, easily removed

COATING...
resists cracking down to very short stubs

SELECTION...
complete line for welding every type of stainless

Get in touch with your PAGE distributor

ACCO

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Portland, San Francisco, Bridgeport, Conn.

PAGE Welding Electrodes AND Rods

Meets Every Requirement...

All-Purpose Stable
Quick-Acting

• 1200 Flux, designed for silver brazing, meets U. S. Government and other standard specifications. It dissolves oxides, including chrome, rapidly ... remains stable at all silver brazing temperatures. And you can brush it on or use any other method of application. Remember ... 1200 Flux, the next time you place your order!

USES

Use 1200 Flux for silver brazing Brass, Stainless Steel, Bronze, Nickel-Silver, Steel, Monel, Inconel, Nickel and Cast Iron. Furnished in ½ lb., 1 lb., 5 lb. and 30 lb. containers.

STEEL SALES

3348 S. PULASKI ROAD • CHICAGO 23, ILLINOIS

PLANTS: DETROIT, ST. LOUIS, MILWAUKEE, MINNEAPOLIS
OFFICES: INDIANAPOLIS, GRAND RAPIDS, KANSAS CITY

Protect your eyes with **MODERN ALL-PLASTIC**

Eye-Savers give you comfortable fit, good-looking construction and *sure* eye protection—all at the same time! One-piece flash goggle 10G3 provides complete safety for under-helmet use and other glare and impact hazards. Shatterproof plastic lens is green tinted, optically clear, and may be replaced. Fits over most style glasses and permits comfortable, wide angle vision. Order from your welding (or safety) supplier or write direct.

FREE! *Send for magazine article giving impartial advice on best uses of plastic eye protection. Eye-Savers catalog also included.*

WATCHEMOKET OPTICAL CO., INC. DEPT. 5, PROVIDENCE, R. I.
Producers & Originators of Practical Plastic Eye Protection

Big Welding Sign for Cleveland's Skyline

A HUGE outdoor advertising sign 62 feet wide was recently erected on Cleveland's Lake Shore Drive by the Burdett Oxygen Co., manufacturer and distributor of industrial gases and welding and cutting equipment.

The strategically located advertisement consists of two sections. The main section of the sign is painted on the upper portion of a building, showing a weldor at work with the company's slogan: "If it's for welding or cutting—we have it." Located just above the painted wall sign are neon letters eight feet tall spelling out "Burdett Oxygen." The vivid colors of the painted sign and the illuminated letters can be seen both night and day for great distances.

* * *

St. Louis Firm Offers Metallizing, Hard-facing

THE Nooter Corp., St. Louis, has announced the establishment of the St. Louis Metallizing Co., to be located at 625 So. Sarah St. Formerly the metallizing division of Nooter Corp., the new firm will retain the same personnel, equipment and management.

Heading the company will be Walter B. Meyer, president; Joseph A. Peressin, vice-president; Raymond Craven, vice-president, and Elmer Stitt, secretary-treasurer.

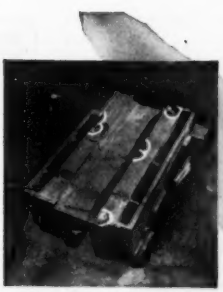
Hard-facing and plastic coating services will also be offered by St. Louis Metallizing. Wear and corrosion resistant alloys will be applied by gas, arc, submerged-arc or inert-arc processes. Plastic sheets and films will be applied to various types of processing equipment.

* * *

Solar Aircraft Forms Special Products Division

A RESEARCH products division has been formed by Solar Aircraft Co., San Diego, Calif., to handle sales of three product lines Solar research turned up. The three lines are welding fluxes and back-up fluxes, "Solaramic" ceramic coatings for metals in high temperature use and stainless castings.

The division is headed by Philip M. Klauber and his assistant, Elliot C. Bacon.



Casting ready for welding. Defects have been chipped out with pneumatic tool and circled with chalk.

How 7 lbs. of Ni-Rod "55" saved a 600 lb. casting

Welder depositing Ni-Rod "55" in cavity. Successive beads will be laid in each cavity up to the proper level of the surrounding cast iron casting.

Finished welds in pump casting. Defects in 600 lb. casting have been corrected with only 7 lbs. of Ni-Rod "55".

It looked like a complete loss . . . this 600 lb. gray-iron water pump casting.

A double loss from the point of material costs *and* production time.

That was until the Atlas Welding Co. of Philadelphia, Penna., found that a quick, simple salvage job with Ni-Rod "55"® could turn the "cast-out" into a sound, usable casting.

How did they do it? Well, here's the full story.

After chipping out defects (due to sand entrapment or gas holes) welding began. Using 3/16″ diameter Ni-Rod "55" electrodes, the welder deposited a bead in each cavity. Slag was then removed easily with a wire brush, the head peened, and the procedure repeated until the job was done. 7 lbs. of Ni-Rod "55" and 1½ hours of welding time . . . That's all it took to save this 600 lb. casting, worth *$260.*

If you are ever faced with the loss of a casting due to slight defects, remember that welding with Ni-Rod "55" may be able to salvage it. Ni-Rod "55" not only gives sound welds that closely match the cast-iron color, but it also gives welds that can be machined to close tolerances.

And Ni-Rod "55" can be used for *all* cast-iron welding jobs including high phosphorus irons and heavy section work.

Remember, however, that Ni-Rod "55" like the other Nickel and Nickel Alloy forms is on extended delivery, so it will pay you to anticipate your needs. Meanwhile for many valuable tips on how you can salvage costly defective castings send for "Ni-Rod . . . an electrode for any cast iron welding." Write for your copy today.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

National
Carbide
EFFICIENT
ECONOMICAL
DEPENDABLE
for
Welding & Cutting
SPECIFY

NATIONAL CARBIDE IN THE RED DRUM
Write us for information as
to nearest available stock.
NATIONAL CARBIDE COMPANY
A Division of Air Reduction Company, Inc.
60 E. 42nd St., New York 17, N. Y.

No more "HUNTIN'" with the NEW...

TIP-O-LITER
Now!
2 in one
1 Thermo Spiral Tip Cleaners
2 3 Flint Spark Lighter
Keeps these essential welding needs right at your finger-tips. Welding quality increases because when cleaners are handy they are used more frequently and clean tips mean better work.
Manufactured by
THERMACOTE CO.
Newark • Chicago • Los Angeles

Buy
TIP-O-LITERS
today at leading welding jobbers everywhere

About People

THOMAS D. CARTLEDGE has been appointed president of Linde Air Products Co., a division of Union Carbide and Carbon Corp. He has been senior vice-president of Linde and a director and vice-president of Dominion Oxygen Co., Ltd., a Union Carbide subsidiary. After Navy service in World War I, he joined Linde as a salesman in Cleveland. In 1925, after service as district manager in Kansas City and Dallas, he was transferred to the New York office, where he later became manager of gas sales. After holding the position of assistant and general sales manager in 1940 he was elected vice-president. Four years later he became senior vice-president, director and a member of the executive committee of Linde. Mr. Cartledge is a member of the International Acetylene Association and the American Iron and Steel Institute.

• • •

FRANK B. POWERS has been elected vice-president in charge of manufacturing of P. R. Mallory & Co., Inc., Indianapolis. He came to Mallory from Federal Telephone and Radio, where he was vice-president in charge of operations and a member of the board of directors. Mr. Powers was previously employed by Westinghouse for a period of twenty years.

• • •

M. L. BOCCALATTE was appointed sales manager of the Aluminum Wire Products Co., Inc., Glastonbury, Conn. He will cover the East, South and Middle West in furthering sales of extruded aluminum wires and welding and brazing wires. Mr. Boccalatte was previously associated with the Aetna Life Insurance Co.

• • •

WALLACE L. HOWE has been appointed director of research and development at Norton Co. Formerly director of development, he now heads activities of both the research and development departments. Mr. Howe has been associated with Norton Co. for 29 years. He replaces DR. SAMUEL S. KISTLER.

Simple Procedure Change Licks Pin Holing

Porosity in horizontal fillet welds was occurring on heavy bases for diesel engines being manufactured by a large locomotive builder. Various makes of electrodes were tried with no improvement.

Metal & Thermit's local sales engineer was asked to investigate . . . quickly uncovered that the plate being used in certain portions of the weldment was off in chemical content. By positioning for flat welding, or, where this could not be done, by using Murex low-hydrogen electrodes, pin holing was completely stopped—production resumed—and parts already fabricated were completed instead of scrapped.

Your nearby M&T representative is qualified to give genuine assistance on any welding problem. Call on him when you need help. Make use of his broad background of experience in every phase of welding.

MUREX®

Electrodes

Arc Welders • Accessories

METAL & THERMIT CORPORATION 100 East 42nd Street, New York 17, N. Y.

Get
4-Way
Savings
Weld with
Phos-Trode*

. . . an all-position phosphor-bronze electrode that's easy to handle.

Phos-Trode is ideally suited for overlay work and for general maintenance and repair welding throughout industry.

In addition you get these 4 important advantages that keep welding costs down.

1. **All position** — Deposit solidifies rapidly — can be used for flat, vertical or overhead welding, operates on reverse polarity DC.

2. **Welds dissimilar metals**— cast iron, bronze, brass, copper, galvanized and malleable iron, etc. and combinations of same. This versatility keeps welding costs down and simplifies your electrode stocking problems.

3. **High deposition rate** — Low spatter loss permits high welding currents for faster welding and lower costs.

4. **Sound deposits, high physicals** — Special ingredients in Phos-Trode coating give properly deoxidized deposits, sound welds and correct bead contour.

Phos-Trode, the most versatile electrode in the phosphor-bronze field, is available in 6 sizes from 3/32" to 1/4". Order your supply now and take advantage of Phos-Trode's 4-way savings.

W-116

AMPCO®

AMPCO METAL, INC.
MILWAUKEE 46, WISCONSIN
West Coast Plant: Burbank, California

It's Production-Wise to Ampco-ize!

*Reg. U. S. Pat. Off., Ampco Metal, Inc.

HAMILTON MIGEL will fill a newly created position of Magnaflux Corp., that of second vice-president in charge of engineering. He will have overall direction of both research and design engineering. Mr. Migel brings to his new post 12 years of experience with Magnaflux customers in company offices in Detroit, Los Angeles, and New York. ROY O. SCHIEBEL, JR., currently midwest manager in Chicago, will move to New York as eastern manager. KERMIT A. SKEIER, former field engineer, replaces Mr. Schiebel as midwest manager.

* * *

DR. PAUL D. MERICA was elected president of The International Nickel Co. of Canada, Ltd. at a recent meeting of the board of directors. He has been executive vice-president and a director. DR. JOHN F. THOMPSON is retiring as president, but will continue as chairman of the board and chief officer of the company.

* * *

PAUL F. VOIGT, JR. has joined Solar Aircraft Co. to serve as consultant on marketing methods and development of new products. He will work with the president, Edmund T. Price. In 1936 Voigt organized the stainless steel division of what is now U. S. Steel Co., subsidiary of U. S. Steel Corp. He managed the division until his retirement from U. S. Steel in February of this year. Earlier, Voigt was associated for 25 years with Allegheny Steel Co.

* * *

RICHARD E. MCGINNIS has been named eastern regional manager for Nelson Stud Welding Division of Gregory Industries, Inc., Lorain, O. He joined Nelson in 1947, has served as field engineer in Atlanta, Toledo and St. Louis and is a member of the American Welding Society.

* * *

DONAL E. OLSON is warehouse superintendent for the new Hibbing, Minn., warehouse of W.P.&R.S. Mars Co., Duluth, Minn. KERMIT R. PETERSON is warehouseman and truckman. Address of the warehouse is 1620 Thirteenth St., P.O. Box 434.

* * *

ARNOLD E. BLITZ has been appointed Pennsylvania Salt Mfg. Co.'s sales supervisor in the ordnance field.

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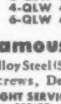	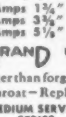	
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WALTER D. JOHNSON has been named sales supervisor of welding positioners and industrial mixers for Worthington Corp.'s western territory. His headquarters will be in San Francisco. Mr. Johnson has been associated with Minnesota Mining & Mfg. Co., E. I. duPont de Nemours & Co., and Shell Oil Co. in various sales and engineering capacities.

* * *

HAROLD A. HALLSTEIN, JR., has been appointed regional manager of Nelson Stud Welding Division of Gregory Industries, Inc., with headquarters at Cleveland. He came with Nelson in 1946 after Army ordnance service. He is a member of the American Welding Society.

* * *

STEPHEN M. MARTIN has been appointed mechanical engineer of Storts Welding Co., Meriden, Conn. He was formerly chief engineer of United Chromium, Inc.

* * *

JOHN BESEMER has been appointed a sales engineer for KSM Products, Inc., stud welding division, Merchantville, N. J. He was formerly employed with United States Radiator Corp. CLAUDE BATUK has also been employed as a sales engineer for the stud welding division.

* * *

A. E. HARRANT was named executive vice-president of Miller Electric Mfg. Co., Appleton, Wis. He was formerly office manager and has been associated with the company for about five years. A. C. MULDER was appointed vice-president in charge of production. Mr. Mulder has been with Miller for the past twenty years in various capacities, including engineering, production and sales.

* * *

DR. FRANK H. DRIGGS has been elected president of Fansteel Metallurgical Corp. and its subsidiary, Weiger Weed & Co. He came to Fansteel in 1934 as director of research. GLEN RAMSEY was elected a vice-president. HENRY D. WEED was elected vice-president and general manager of Weiger Weed & Co., where he has been divisional manager since 1947. JOSEPH A. TEECE was re-elected vice-president of Fansteel in charge of manufacturing.

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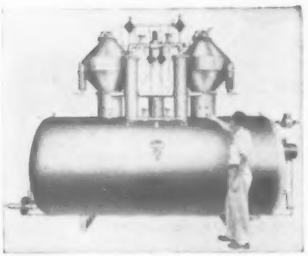

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BOOK REVIEWS

Ventilation for Welding

EXHAUST HOODS. By J. M. Dalla Valle. Published by The Industrial Press, New York, 1951. Fabrikoid, 141 pages. Price $3.50.

A primary source of data on exhaust hood design is provided by Prof. Dalla Valle, who has 20 years' experience with exhaust ventilating systems and industrial hygiene problems. He has assembled both fundamental theory of air flow around and into the openings of exhaust systems and practical knowledge of hood designs.

Four chapters of the book are devoted to the flow of gases, velocity characteristics of canopy hoods, and criteria for determining hood effectiveness. Five chapters cover actual hood design for various types of applications. Other chapters cover boothlike structures, grille openings, woodworking machinery, examples of hood design calculation, entrance losses and the essentials of good construction. Sample problems, with the solutions worked out in detail, are given in a separate chapter. The author is professor of chemical engineering at Georgia Institute of Technology.

* * *

Arc Welding

MODERN ARC WELDING. Published by The Hobart Trade School, Troy, Ohio, 1952. 544 pages. Price $3.

This is a comprehensive and practical textbook on arc welding procedure and applications. It was designed to help students, engineers, weldors and machine designers.

The text falls in 28 chapters that are divided into five main sections. The first discusses the development of arc welding, describes applications, metals and alloys, joints and connections, electrodes, equipment and basic procedures.

Part two constitutes a complete self-study course, including review summaries, practical exercises and quiz questions. Carbon arc welding is explained in the third section. The fourth part reviews such welding processes as inert-arc, submerged-arc and stud welding. The last section discusses welding terms and their definitions as set by the American Welding Society. More than 600 photos, diagrams and charts illustrate the text.

* * *

You have no more right to consume happiness without producing it than to consume wealth without producing it.—G. B. Shaw

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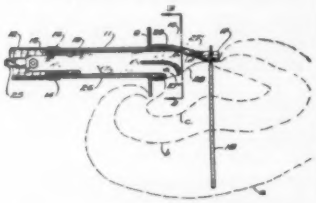
FORT WAYNE, INDIANA

From the Patent Office

Gas Torch

2,592,505. JOHN S. WOLFE, Milwaukee. Filed March 17, 1949. Granted April 8, 1952.

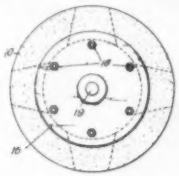


This patent describes a torch having a wall member that forms a hollow elongated nozzle. Parts of the wall member are longtudinally curved and shaped to form an outwardly flaring intake opening in the side of the nozzle, next to its end. Air exhaust means are connected to the other end of the nozzle for inducing air to enter the opening and to flow through the nozzle. There are dividing walls within the nozzle next to the side opening.

* * *

Anti-Burst Grinding Wheel

2,594,137. ALBERT J. DOERMANN, Chicago. Assigned to Titan Abrasives Co. Filed Sept. 12, 1949. Granted April 22, 1952.



A newly patented grinding wheel consists of a number of adjacent grinding disk-like elements each having a number of tongues on one side. Each tongue engages a groove on the adjacent side of the next disk element. One of the cooperating side edges of a tongue and groove are inclined toward an adjacent other of the cooperating side edges from a point nearer the center of the wheel toward the periphery. This aids in restraining a broken section of either element that includes at least part of a tongue and a groove from being thrown outwardly by centrifugal force when the wheel is rotated.

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TIP CLEANERS
STANDARD SET OF 12
Cleans 27 Drill Sizes.
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The exclusive circle design found only in Wypo Cutting and Welding Tip Cleaners provides as many as 60 more cleaning edges per inch of cleaner. Straight sided valleys, another outstanding feature of Wypo Tip Cleaners, insures a thorough cleaning and removal of all waste.
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Fast, easy cleaning without jamming, scratching or enlarging the tip port means added years of service to your welding and cutting tips. Only with Wypo Tip Cleaners do you get thorough cleaning and polishing with one quick and easy motion. Wypo Tip Cleaners are specified for all types of welding cleaning jobs by the U.S. Navy, leading railroads, oil companies, steel mills, ship yards and industrial plants. Packed in a handy metal container.
U.S. Patent No. 2,429,581
In Canada 1948
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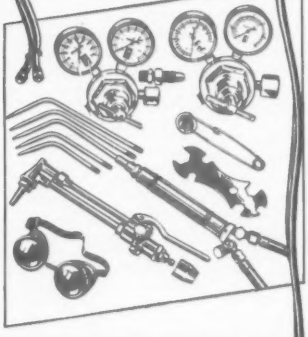

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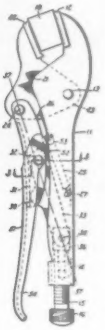
Toggle Wrench Release

2,590,750. Bruce Burns, Yucca Valley, Calif. Filed June 1, 1948. Granted March 25, 1952.



This patent refers to a toggle wrench having pivotally connected stationary and movable jaws. The stationary jaw has a handle. A toggle mechanism is connected with the movable jaw and has for one of its components a lever movable toward and from the handle of the stationary jaw. An extension piece is positioned outside of the lever and is pivotally connected at its forward end to the middle of the lever. It engages the lever and extends rearwardly from it and forms a handle arranged opposite the handle of the stationary jaw. It is adapted to be grasped simultaneously with the stationary jaw handle for moving the lever inwardly for closing the jaws. The extension piece is also movable away from the handle of the stationary jaw and has means engageable with the handle to forcibly retract the lever from it.

* * *

Low-Alloy Weldable Steel

2,586,042. John M. Hodge and Richard D. Manning, Pittsburgh, Pa. Assigned to United States Steel Co. Filed April 6, 1951. Granted Feb. 19, 1952.

This patent covers the composition and treatment of a low-alloy, high-strength steel that is tough and welds easily. It is heat treated by cooling rapidly from an austenitizing temperature to obtain a martensitic microstructure. It is then tempered at temperatures over 1,100 F. The steel is composed percentage-wise of .10 to .20 carbon, .60 to 1.00 manganese, .70 to 1.00 nickel, .40 to .80 chromium, .40 to .60 molybdenum, .03 to .10 vanadium, .002 to .006 boron, .15 to .35 silicon, 0 to .50 copper, balance iron and residual amounts of other elements.

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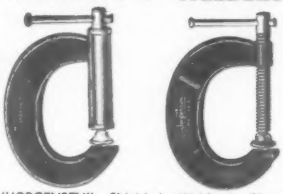
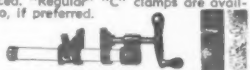
CLAMPS for WELDERS:



"JORGENSEN" Shielded Welders' Clamps eliminate damage from "spatter", and are low-priced. "Regular" "C" clamps are available too, if preferred.



"PONY" Clamp Fixtures make ideal bar clamps on any length of black pipe. Fast operating—sure holding—and most economical.

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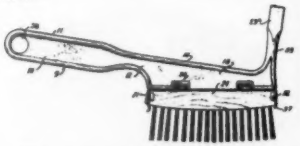
ADJUSTABLE CLAMP COMPANY
"The Clamp Folks"
426 N. Ashland Ave., Chicago 22, Ill.

Cleaning and Chipping Tool

2,592,648. JOHN W. BOWERS, Wallingford, Pa. Assigned to The Fibre-Metal Products Co., Chester, Pa. Filed Feb. 19, 1948. Granted April 15, 1952.



This patent covers a combination weld cleaning tool having a handle with an extension on it. The handle and extension comprise a web and a peripheral bead. A pair of abutments are integral with the extension and are arranged in a plane normal to it. A pair of brackets are removably carried by the abutments. There are means on the brackets to either fasten or remove a wire brush. A chisel constitutes an integral continuation of the peripheral bead on the extension.

* * *

Corrosion Resistant Weld

2,588,700. OTIS R. CARPENTER, Barberton, O. Assigned to The Babcock & Wilcox Co., Rockleigh, N. J. Filed July 26, 1945. Granted March 11, 1952.

This patent covers a welded piping installation that carries corrosive fluids at steel embrittlement temperatures (600 to 1,000 F.). The steel components have the following compositions by per cent: carbon 0.2, manganese 1.5, sulphur 0.025, phosphorus 0.025, silicon 0.75, nickel 1.0, chromium 26.0 to 30.0, nitrogen 0.12 to 0.25, the balance iron and the usual impurities. Two-pass metal welds unite the components. The root deposit is a steel which on quick cooling from temperatures above 1,250 F. will retain its maximum resistance to corrosion without excessive increase in hardness and without excessive reduction in ductility. This weld metal has a chromium content of the order of that of the components and a nickel content of about 4%. The second pass of weld metal overlies the root deposit and fills the rest of the weld groove. It is a different type of steel which can be cooled quickly from 1,375 F. or below without appreciable hardening but which will harden when cooled quickly from above 1,375 F. It has good ductility when quenched from 1,375 F. Its composition by per cent: carbon 0.08 max, manganese 0.4 to 0.6, silicon 0.4 to 0.6, chromium 6.0 to 8.0, molybdenum 0.4 to 0.6, sulphur 0.025 max and phosphorus 0.025 max, balance iron and usual impurities.

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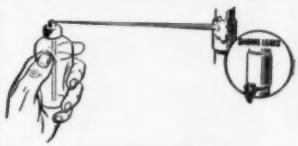

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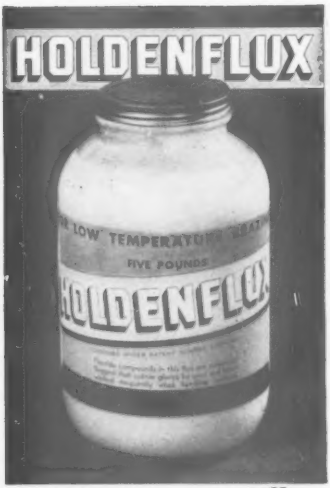

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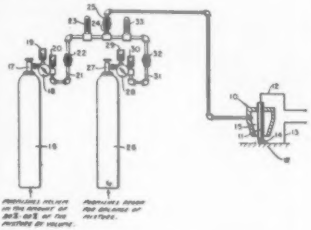
For the most complete line of Welders' Clamps see your nearest distributor.

THE CINCINNATI TOOL CO.
1944 Waverly Ave., Cincinnati 12, Ohio

Inert-Arc Method

2,591,926. GLENN J. GIBSON, Chatham, and GILBERT R. ROTHSCHILD, Somerville, N. J. Assigned to Air Reduction Co., Inc. Filed July 3, 1948. Granted April 8, 1952.

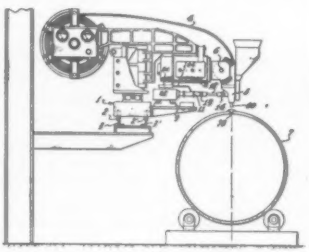


Newly patented inert-gas-shielded arc welding method claims the improvement of a new mixture of shielding gas. The mixture of inert gas for shielding the arc is homogeneous. From 20 to 60% of the mixture by volume is helium and the balance is argon.

* * *

Welding of Cylinders

2,591,809. ROY E. HANSON, Altadena, Calif. Filed July 25, 1949. Granted April 8, 1952.



A newly patented apparatus was designed to weld longitudinal seams in metal cylinders. An electrode carriage is arranged for straight-line movement parallel to the seam to be welded. A welding head is pivotally suspended from the carriage. For giving motion to the welding head crosswise of the seam there is provided a cylinder having a longitudinal slot in its inner wall. A piston slidably mounted for reciprocating travel is in the cylinder. The piston rod is connected to the welding head. The slot in the cylinder is of uniform depth throughout the center one-third of the travel of the piston. Depth of the slot progressively diminishes in each direction from the center one-third, however.

* * *

The optimist proclaims that we live in the best of all possible worlds; and the pessimist fears this is true.—James B. Cabell

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The stay soft leather

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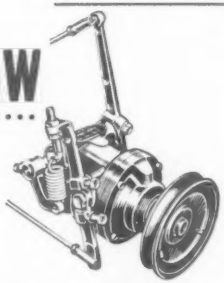

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gives accurate "variable speed" or "constant speed" engine control between 1200 and 2600 RPM.

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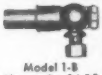

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Sell-on-sight Bull Dog Hitches . . . the ball and socket coupler that can't let go. Heavy drop forge steel construction for trailers up to 2500 pounds. Shank diameter—1⅜". Fits 1⅛" pipe tongue.

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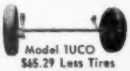

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JACK—satisfied customers bring in others. Bull Dog Jacks make easy, one-man job of parking or hitching trailers—farm implements. All steel. Heavy duty, ball-bearing swivel action. "Can't lose" crank. Complete with brackets, ready to install.

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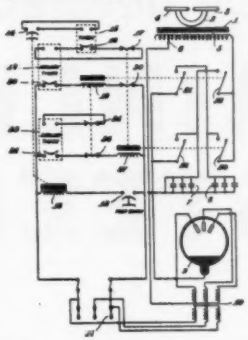
Write today for descriptive folders and price sheets. Substantial, worth-while discounts to established shops.

Hammer Blow Tool Company

Wausau 19 F, Wisconsin

Welding Supply Circuit

2,591,972. CHARLES E. SLADE, Wembley, and ARTHUR KERSHAW, London, England. Assigned to The Hartford National Bank and Trust Co., Hartford, Conn. Filed in U. S. Jan. 17, 1948. Granted April 8, 1952.



This patent refers to an electric welding system for producing a welding voltage. It includes a transformer having primary and secondary windings and two capacitor elements. A direct voltage source is provided for charging the capacitors. A first switch is arranged upoh actuation to connect simultaneously the first capacitor across the source and the second capacitor across the primary. A second switch is arranged to connect simultaneously the first capacitor across the primary and the second capacitor across the direct voltage source. Two electromagnetic relays and two normally-closed switches are respectively connected in series. The first relay on being energized actuates the first mentioned switch and opens the second switch. The second relay on energization actuate the second switch and opens the first switch. Only one of the members may be actuated at any one time.

* * *

Inert-Arc Electrode

2,594,905. CHARLES J. GALLAGHER, Schenectady, N. Y. Assigned to General Electric Co. Filed March 30, 1950. Granted April 29, 1952.

Instant arc starting and maintenance of a stable arc are claimed for a newly patented non-consumable cored inert-gas-shielded electrode. The electrode consists of a metal having high heat conductivity and a low melting point relative to the electrode core. The core comprises a material selected from the group thoria, zirconia and ceria.

* * *

To obtain additional information on any advertised products, use the cards on pages 17-18.

Mk-h	100%
Pk-h	100%
Se	100%
Tr	100%
ED	100%

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FOR WELDING BRAZING SOLDERING TINNING CUTTING

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- in uniformity
- in operator training
- in dependability
- in quality

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White Plains, N. Y.

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featuring:

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★ **BRAZING**—An article covering the fabrication of stainless steels using silver brazing alloys.

★ **CLEANING**—This article is devoted to the pre-weld and post-weld cleaning of stainless steels.

★ **FINISHING**—Covering a most important operation, this article will be devoted to the grinding and polishing of welds on stainless steel fabrications.

★ **A big feature of this issue will be a comparable trade name data sheet covering stainless steel electrodes.**

The October issue of THE WELDING ENGINEER will be the Metal Show Number and will cover the Show in its usual full fashion. Program of the Show and the annual meeting of The American Welding Society will be given full play. If you can't get to the Show in Philadelphia, this issue will tell you all about it!

Features like the above can be found only in—

THE WELDING ENGINEER

330 W. 42nd St. New York 36, N. Y.

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REPLIES (Box No.): Address to office nearest you
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CHICAGO, 520 N. Michigan Ave. (11)
SAN FRANCISCO, 68 Post St. (4)

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HIGH TYPE manufacturers agent calling on welding distributors mid-west, mid-south to sell highly accepted apparatus and supplies, established accounts most areas. RW-4505, Welding Engineer.

SALES ENGINEER, experienced stainless welding and hard facing. To work as specialist in these fields with national sales organization now selling mainly mild steel electrodes. Opportunity to create important position in one of the leading companies in the arc welding industry. Midwest location. Straight salary. Write giving experience and personal data. SW-4475, Welding Engineer.

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WELDERS—electric

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OR . . . something you don't want— that other readers can use—

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With experience in welding high alloy metals and some sales experience. Free to travel, and of sane habits. Good salary, expense allowance and bonus to right man. Write complete details of past experiences. All replies confidential.

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900 AMP. MODEL 6WK1C2
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Arcos, 1/8" Chromang 19/9 MN Type, 307 Stainless.....40c-lb.
Murex, 5/32" 18/8 MO Stainless.....60c-lb.

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1301 Wyoming Avenue Scranton, Penna.

1000 AMP. A.C. WELDERS

7 G.E., 3 Westinghouse, 220/440 Volt, with/without Linde Electronically Controlled Union Melt Heads—BARGAIN.
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Los Angeles 58, Calif.

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4,050	1/8"	Airco	18-8
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BRONZE, STAINLESS, AMPCOTRODES.
NO. 12 LENSES, ELECTRODE HOLDERS.

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Quickly attached. High flashback resistance. Cutting range 1/8" to 6". 75° or 90° head.

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Also Complete Outfits, Cutting Machines and Accessories

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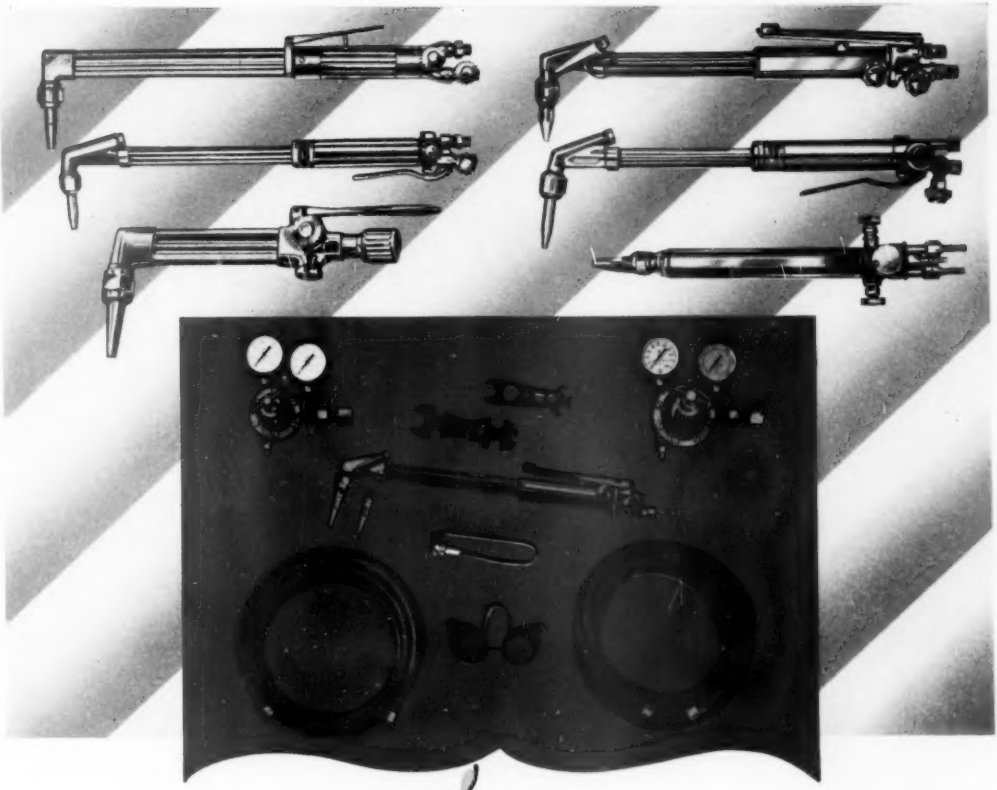

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78th ANNIVERSARY 1874 - 1952

For complete information, write direct to: A. O. Smith Corporation, Welding Products Division, Dept. WE-752, Milwaukee 1, Wisconsin